

TRANSFERABLE  
PROPERTY RIGHTS  
TO WATER  
THE NEW ZEALAND EXPERIENCE

Nicholas J Allison

February 1988

Final Report to Treasury  
and partial fulfillment for an  
M.S.C Resource Management

## ABSTRACT

The report has been designed as a small input into the present review of the resource use statutes. As conflict between competing or potentially competing users of water has become more common, there is a need to review the manner in which we allocate water resources in New Zealand. An alternative resource allocation mechanism to the present administrative system is a market mechanism. The report examines theoretical literature on transferable property rights to water and the actual experience New Zealand has had with a water market. Drawn from the analysis are several policy recommendations on the form of the institutional structure a water market could take in New Zealand.

The views expressed in this paper are the responsibility of the author and do not necessarily reflect those of the New Zealand Treasury.

## ACKNOWLEDGEMENTS

Without the help, freely given, by a large number of people this report could not have been written. I am indebted to Terry Hearn and the Otago Catchment Board staff who patiently outlined the intricacies of mining privilege system. The challenges to my ideas from Treasury staff were often a source of insight which led to subsequent restructuring of the report.

My thanks goes to people who have freely given their time to me in interviews. Also, I am grateful to John Wilson, Basil Sharp, Cathy Sharplin and Rodney Hide for thoroughly criticising my draft report and for their support and encouragement.

Finally, my thanks goes to Kirsty Campion and Sandy Weatherston – the typists who struggled with my script and put in the additional hours which meant the report could be published on time.

## TABLE OF CONTENTS

	<u>Page No</u>
Abstract	i
Acknowledgements	ii
1.0 <b>Introduction</b>	1
1.1    Background	1
1.2    Study Objectives	3
1.3    Study Outline	4
2.0 <b>Water Rights Transfers : Contemporary Theory</b>	5
2.1    Introduction	5
2.2    Doctrine of Prior Appropriation	6
2.3    Doctrine of Equal Sharing	7
2.4    Water Transfers Property Right Specification	10
2.5    Water Transfers Efficiency Conditions	13
2.6    Water Transfers : Prior Appropriation	14
2.7    Water Transfers : Instream Rights	16
2.8    Summary	17
3.0 <b>The Mining Privilege System of Water Allocation</b>	19
3.1    Introduction	19
3.2    Mining Privilege System Central Otago : Outline of Property Rights Structure	20
3.3    Mining Privilege System : The Expected Outcomes	23
3.4    Pattern of Water Transfer	26
3.5    Externalities : Third Party Impairment	28
3.6    Transaction Costs	30
3.7    Efficiency	31
3.8    Equity	33
3.9    Summary	34
4.0 <b>A Market for Water in New Zealand</b>	36
4.1    Introduction	36
4.2    Initial Allocation Process	36
4.3    On-going Allocation	38
4.4    Transfer Arrangements	39
4.5    Instream Rights : National Vs Regional Allocation	45
4.6    Pollution	49
4.7    Water Monopolies	51
4.8    Treaty of Waitangi	52
4.9    Summary : Policy Recommendations	53
5.0    Concluding Comment : A Cautionary Note on Equity and Efficiency	55
Appendices	57

## 1.0 INTRODUCTION

### 1.1 Background

There is increasing conflict and competition among water user groups in New Zealand. Conflict between competing or potentially competing users of water has now become common.<sup>1</sup> The problem is likely to get worse. While the demand for water will probably increase, its supply is limited. Moreover changing social and economic conditions are likely to make the reallocation of water rights desirable. In several areas of New Zealand the availability of water has now become an effective constraint to development.<sup>2</sup>

At present the reallocation of water among competing uses can only be achieved by regional water boards not reissuing water rights when they expire or, where possible, by the cancellation of existing rights. In neither situation are water right holders compensated.<sup>3</sup> In order to achieve greater flexibility in the management of water resources regional water boards, in recent years, have tended to grant water rights for shorter terms and subject to stricter conditions.<sup>4</sup> In areas where water has become a major constraint on development, shorter water right terms and stricter conditions on rights may possibly lead to uncertainty over future supply. This in turn would be a disincentive to invest in productive activities dependent on long term access to water.

---

1 Milne, Philip J. Water Resource Allocation and Management in New Zealand : Recent Developments, in New Zealand Universities Law Review 11 (3) : 245-271, P.245, 1985.

2 A good example is the Waimea Plains where a moratorium on further water extraction has been put in place. [Hawkes Bay, South Auckland, Bay of Plenty, Canterbury and Otago are all areas in which water rationing now occurs.]

3 Hide, Rodney and Sharp, Basil. Piecemeal Reform of Water Resource Institutions Paper to the New Zealand Association of Soil Conservators Conference, P3, May 1987.

In addition to problems of inflexibility and possible uncertainty over future supply, the existing allocation mechanism does not signal the value of the resource to present and potential users. Where conflict exists over the supply of water, the Planning Tribunal and Water Boards make the necessary allocation decisions. The primary criterion on which such decisions are based is "beneficial use" – how the costs and benefits of water allocation can and should be distributed among competing interests. To a large degree these decisions involve explicit value judgments.<sup>5</sup> In the absence of a mechanism which indicates the value of water resources it is difficult, if not impossible, to make an impartial and accurate assessment of how costs and benefits will be distributed.

Problems of inflexibility and increasing conflict have led several authors to suggest tradeable property rights as a mechanism for allocating water. Water-right holders would have an incentive to take account of the value placed on their resource by others. Users would be motivated to use the resource more efficiently because they would face an opportunity cost of water use as their water rights could be sold. Thus water right holders would have an incentive to conserve water through the use of more efficient technology. A market for water would encourage flexibility as new and highly valued users could be quickly accommodated by the exchange of water rights. Since prices would signal the value of changes in water abstraction, information useful to deciding instream flows for recreation and conservation purposes would be provided. Prices would also indicate the value of using water for waste disposal. In sum, tradeable water rights are viewed as potentially more efficient, responsive and flexible than the existing system of water allocation.<sup>6</sup>

---

4 Terms of five to ten years are common. See Milne P g. 265.

5 Milne, Philip J. Pg. 246 – 247

## 1.2 Study Objectives

The only sensible reason for suggesting New Zealand should adopt a system of transferable water rights is that such a move will make us better off. That is transferable rights will reduce conflict, conserve water and lead to a more equitable allocation of water. Overseas experience suggests voluntary transfers of water will indeed lead to more efficient water use. For example the Metropolitan Water District of Southern California (MWD) has offered the Imperial Irrigation District \$10 million per year to fund water conservation measures that would salvage 100,000 acre feet of water annually for use by MWD.<sup>7</sup> However, what works well overseas may not necessarily work for New Zealand.

Fortunately, New Zealand has had over a century of experience with a water market in Central Otago<sup>8</sup> between 1858 and 1971. This anomaly in New Zealand's history of water management arose because mining privileges granted under mining acts made provision for private transferable water rights. Deemed as chattel interests, they were subsequently sold to farmers for irrigation. This experience with water markets presents us with an opportunity to learn, first hand, about their likely consequences. Such an understanding can be used to enable better design of policy reforms aimed at facilitating trade in water.

This study will examine:

- The structure of the property rights to water under the mining privilege system.

---

<sup>6</sup> Hide, Rodney and Sharp, Basil Piecemeal Reform of Water Institutions Paper to the New Zealand Association of Soil Conservators Conference 1987.

- The transaction costs and externalities associated with transfers.
- How the information generated by the Otago experience can be used in the design and implementation of water markets in New Zealand.

### 1.3 Study Outline

There are four sections to the report. It proceeds with a brief account of contemporary economic theory of transferable property rights to water. This theoretical framework, in conjunction with an outline of the property right arrangements to water under the mining privilege system, is used to predict the nature of externalities and transactions costs associated with mining privilege water transfers. Evidence is sought to support or refute these predictions. An extensive appendix contains a detailed account of the operation and property right arrangements of the mining privilege system of allocating water. The final section examines the administrative and other property arrangements required to introduce transferable water rights in New Zealand. Particular emphasis is given to how we can learn from the Otago experience by the design of property rights arrangements which would avoid the shortcomings of mining privilege system of water transfers.

---

7 Environment Committee Group on Natural Resource Management. Use of Water Rights: Recent United States Developments in Water Market. Organisation for Economic Co-operation and Development . ENV/NRM/87.7, 1987.

8 Since the opportunity for trade in water arose out of mining privileges, granted under mining acts, it is possible trade in water rights would have taken place elsewhere in the country. Otago, however, with its early concentration of mining and arid conditions offers the best example.



## 2.0 WATER RIGHT TRANSFERS : CONTEMPORARY THEORY

### 2.1 Introduction

Trade is likely to occur where individuals place different values on a resource, the resource has a scarcity value and the gains from trade are not outweighed by large transaction costs. Trade is a transfer of rights. In order to be transferable a right must be clearly delimited and enforced. If a right is unenforced, it is effectively no right at all. As trade allows resources to gravitate towards users who place the highest value on them, the aggregate value obtained from using resources can increase. However, if trade is to increase the aggregate value of resource use for society, rights have to be specified in a way which ensures actors internalise costs. Costs not internalised are negative externalities. Where negative externalities occur others bear additional costs, hence the transfer of resources to users who place a high value on them will not necessarily increase the aggregate value of the resource use to society.

The need to enforce rights, and to specify rights in a manner which internalises externalities in order to ensure trade results in increased aggregate value, means that transaction costs could be quite substantial.<sup>9</sup> The larger are transaction costs, the smaller the gains from trade, and thus the less likely it is that trade will occur. The analysis below emphasises how property rights to water can be specified in a manner which internalises costs and benefits, minimises costs of specification and enforcement, and thus ensures transaction costs are kept to a minimum.

The analysis proceeds by considering two different ways in which water can be rationed to accommodate variability – the doctrine of equal sharing and the doctrine

---

<sup>9</sup> Randall, A. 1975, Property Rights and Social Micro-Economics Natural Resource Journal, 15: 729-738.

of prior appropriation. How rights can be defined to avoid third party impairment, and thus facilitate trade, is then examined. Next, the circumstances under which a market allocation of a water resource will deviate from the traditional economic efficiency condition, i.e. the productive value of the resource use at the margin is equal across all users, is investigated. Of particular importance, with respect to the efficiency conditions, is how instream rights<sup>10</sup> affect the transferability of consumptive rights. The analysis focuses on how property rights to water can be delimited in order to minimise transaction costs.

## 2.2 Doctrine of Prior Appropriation

The doctrine of prior appropriation is a means of accommodating the inter-temporal variability of water resources. Rights are specified in terms of the quantity taken, the purpose of use and the point of diversion. The temporal priority of a right is established by the date of filing the application to appropriate water. In times when the river flow is inadequate to meet the requirements of all rights, the earliest priorities are entitled to water before later priorities. Junior right holders have to cease or lower their rate of extraction in order that senior appropriators' rights can be fully met.

An alternative to temporal priority would be to delimit rights on the basis of flow rates. Low priority rights would be those that were shed as river flows fell below critical levels. However, delimiting rights on the basis of flow rates would impose an additional enforcement cost: monitoring river flows. Where rights are based on temporal priority, the major enforcement cost is that of ensuring appropriators take only their entitlement. In contrast, if flow rates were used to delimit rights, in addition to the need to enforce the quantities diverted by individual appropriators,

---

<sup>10</sup> Instream rights pertain to non-consumptive water rights. For example, water for fishing or other recreational purposes.

river flows would have to be measured and constantly monitored. In comparison to delimiting right on the basis of flow rates, a system which uses temporal priority has lower enforcement costs.

Although a system of rights based on temporal priority has lower enforcement costs in comparison to a system which delimits rights on the basis of flow rates, it does not necessarily follow that it will have a lower transaction cost. To evaluate the effect the two different ways of specifying rights have on transaction costs, their effect on certainty has to be examined. As certainty decreases, greater costs are imposed on individuals in terms of risk and the likelihood of conflict. Where the boundaries between individuals rights are unclear, individual actions carry a greater risk of infringing other rights and hence producing conflict. Greater risk is also likely to encourage individuals to make more conservative resource use decisions and thus lower the value of a resource at any given point in time. A system of property rights which minimises uncertainty also helps to minimise transaction costs.

Because the margin for error in measuring river flows may be substantial, a system of rights based on flow rates could generate additional risk and conflict in comparison to system based on temporal priority. Where temporal priority is used to delimit rights the common boundary between rights is time. In contrast to time, the measure of river flow rates leaves a considerable margin for error. Such a margin would increase the risk underpinning individual appropriators decisions and, where errors occurred, conflict between appropriators may result. Since a system based on measuring flow rates is, at the very best, not likely to change the certainty surrounding rights and carries the added enforcement cost of monitoring river flow rates, it will entail a larger transaction cost in comparison to a system based on temporal priority.

### 2.3 Doctrine of Equal Sharing

The doctrine of equal sharing is another means of allocating property rights in order to deal with the problem of variable flows. Under a pure doctrine of equal sharing, if the flow falls below the volume required to supply all water rights, water deficits are shared equally among appropriators. New Zealand Water Boards have generally adopted the doctrine of equal sharing in an attempt to distribute hardships caused by low flows equally among and within user groups.<sup>11</sup> They have generally opted for water allocation plans which require particular groups of users to share water deficits among members and, at certain critical flows, to stop abstraction altogether.

As argued above, a major specification cost of systems which delimit boundaries between rights on the basis of flow rates is monitoring. This can clearly be seen in the case of Hawkes Bay. The Catchment Board is involved in the weekly monitoring of flow rates and the computation of the reductions individual appropriators have to make to accommodate water deficits. Because reductions are made on a proportionate basis relative to the size of the right, and depend on variable stream flows and the number of appropriators actually using their rights, individual right holders are not always in a position to calculate the necessary reductions in abstraction themselves. Thus, in times of water deficits, the Hawkes Bay Catchment Board is involved in the weekly monitoring of flows and the revision of individual

---

11 This approach has been interpreted as being consistent with the multi-purpose intent of the Water and Soil Conservation Act 1967. Within the most common user group, farmers, local irrigation committees are sometimes used to ration water among members. Attempts by water boards to share hardship equally among users has led to conditions being placed on licences. These specify times and rates of extraction, dependent on flow rates. For an overview of how water boards ration flows see Wallace P. K. The Flexibility of Water Resource Management Thesis, Masters in Resource Management Canterbury and Lincoln College. For a regional example of this form of rationing see Catchcart, R. W. et al. 1983. Rakaia River Catchment and Central Plains - Draft Management Plan North Canterbury Catchment Board and Regional Water Board, Christchurch.

appropriators abstraction rates.<sup>12</sup> Attempts to distribute hardships caused by low flows equally among groups in New Zealand has created a substantial monitoring role for Water Boards.

Two water allocation plans, one based on prior appropriation and one the based on sharing hardships, can be found in appendix four. The Opihi River allocation plan involves six different user groups who come under various obligations dependent on flow rates and the conditions attached to their licences. Clearly, at the very least, this involves the board in monitoring of flow rates. In contrast, the prior appropriation plan for the Lindis River is a simple priority listing. The water holders look after monitoring and enforcement themselves.

In contrast to prior appropriation, equal sharing provides an incentive to ensure water resources are under-used. Along a stream where summer time flows are fully appropriated every new right issued could potentially have a negative impact on existing rights. Holders of existing rights are thus encouraged to object to water right applications.<sup>13</sup> Water authorities, where possible, will respond by tightly defining the time, place and rate of extraction to satisfy objectors. Alternatively, the application for the right will be refused. In contrast, under prior appropriation, the maxim of 'first-in-first served', ensures that the issue of additional rights will not reduce flows available to existing rights. Right holders cannot object on grounds of a diminished supply of water. Expensive and time consuming hearings over water right applications can thus be avoided and peak as well as low flows fully used.

In addition to the transaction costs incurred through objections to the granting of rights and the monitoring of flow regimes, equal sharing generates added enforcement costs. When flows are inadequate to supply all rights the reduction in

---

12 per com Ian Kenyes Hawkes Bay Catchment Board

13 Indeed a cursory survey I made of objections to the granting of new water rights indicated the threat of a diminished water supply is a common basis for objections.

abstraction has to be enforced over all rights. In contrast, under prior appropriation, the reduction in abstraction, except in exceptional circumstances, need only be enforced over junior right holders. It is relatively easy to observe whether a few junior rights have stopped abstraction in comparison to evaluating whether or not all rights have reduced abstraction by a given percentage.<sup>14</sup>

The reader may object that where a water market exists an allocation of rights based on prior appropriation would gravitate to the same allocation which exists under equal sharing. That is in a perfectly competitive market, assuming  $n$  identical firms, each appropriator would purchase a  $1/n$  share of each water right. However this is a highly unlikely outcome. It is unlikely firms will be identical and, as will be evident further in the analysis, the transaction cost involved in transfers of water may be considerable. To achieve equal sharing  $(n-1)^2$  transactions would be necessary. Where  $n$  is large, the cost of transactions of each  $1/n$  share is likely to exceed the gains from trade. Further, as the allocation approaches equal sharing, enforcement costs increase.

## 2.4 Water Transfers: Property Right Specification

In order to make the analysis more conducive to readers not familiar with the economic theory of transferable water rights an illustrative example of water transfers is used. In figure 1, on page 11, a segment of stream is pictured along which four water abstractors, (1) to (4), are located. In serial order each user extracts a total of 200, 200, 150 and 50 units of water respectively. Their return flow coefficients are represented by the letter  $R$  where  $0 < R < 1$ . These

---

<sup>14</sup> A given volume of water will, depending on the irrigation method used, generally irrigate a set area of land. Thus in situations where metering devices are not used, appropriators can fairly readily observe if individuals are taking substantially more than their quota. However, small reductions in abstraction rates enforced by equal sharing may be hard to detect without the use of expensive metering devices.

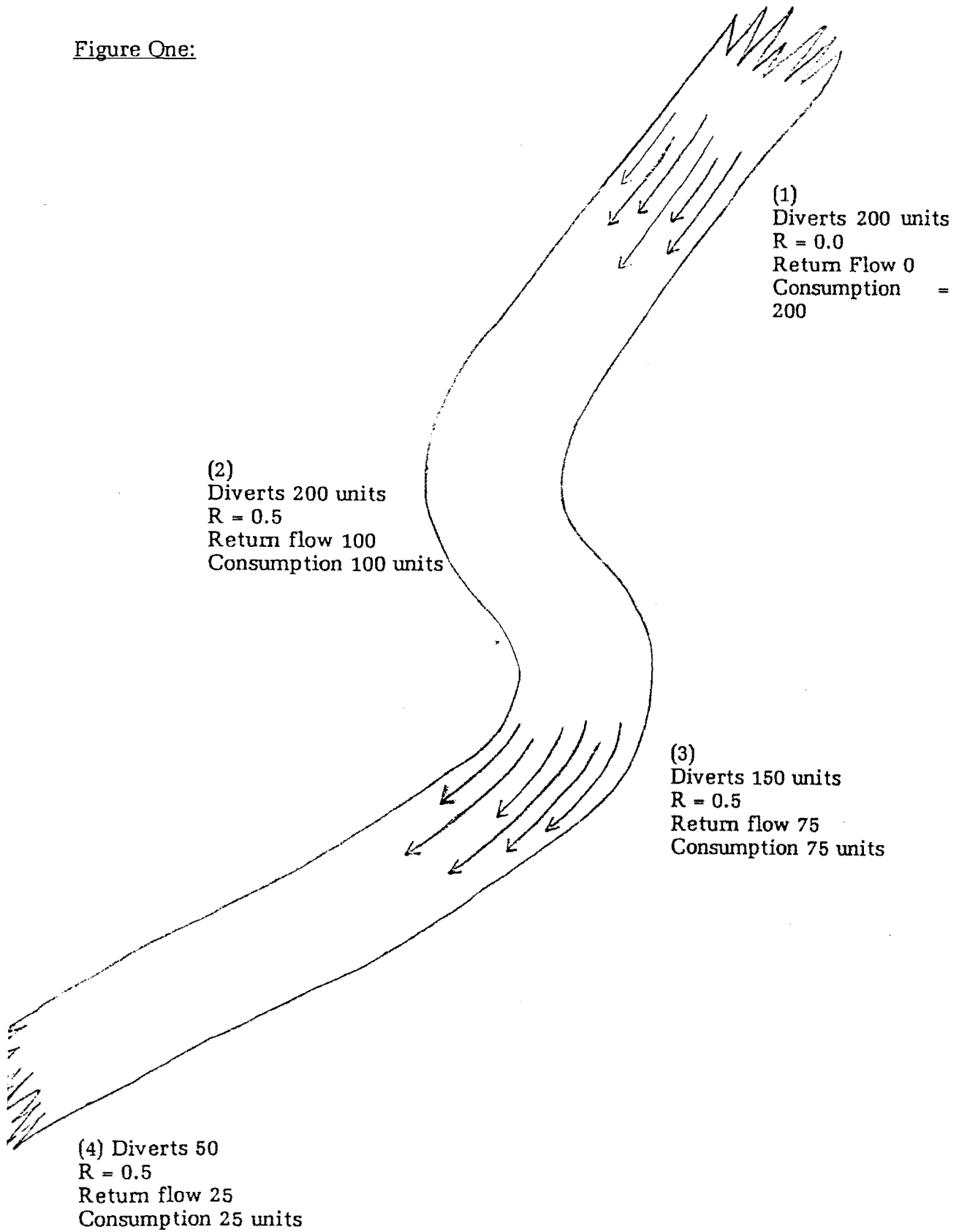
coefficients are listed in the figure beside the quantities diverted. By multiplying the quantity diverted by  $(1-R)$ , each abstractor's consumptive use can be determined. At the head of the stream 450 units of water are available for diversion. In aggregate the four users divert 625 units of water, 175 units over and above that which was initially available. This is possible because water is used and reused as it moves down the stream.

It is not hard to conceive of ways in which things could go wrong when rights are specified only in terms of diversion. Consider a transfer of 100 units of water, half of (2)'s water right, from (2) to (1). Since (1)'s return flow coefficient,  $R = 0.0$ , is lower than (2)'s,  $R = 0.5$ , aggregate consumption must increase. The increase is at the expense of users (3) and (4) who depend on (2)'s return flow. In fact, where property rights to water are defined on the basis of diversion, transfers along a fully appropriated river will cause third party impairment whenever they alter the ratio between consumptive use and diversion.<sup>15</sup> These externalities could be avoided if entitlements to return flows had been defined explicitly. However, in a world of positive transaction costs, defining numerous rights to return flows is impractical.

---

15 For a more thorough discussion on consumptive use rights see Gisser & John, Institutional Restrictions on the Transfer of Water Rights and the Survival of an Agency in *Water Rights, Scarce Resource Allocation, Bureaucracy, and the Environment* ed. Terry L. Anderson Ballinger Publishing Company 1983.

Figure One:





If rights were defined in terms of consumption, the third party impairment described above would be overcome without the need to define numerous entitlements to return flows. Consider again the transfer of 100 units of water from (2) to (1). Where rights are defined in terms of consumptive use the transfer would result in (2) relinquishing any right to divert water. To see this recall (2)'s return flow coefficient is 0.5 hence of the 200 units diverted 100 are returned for use by other users and 100 are consumed by (2). In this case, since the transfer does not result in a change in aggregate consumption third party impairment of those relying on the return flows of (2) does not occur.

However, defining rights on the basis of consumptive use merely lowers the risk that transfers will generate externalities. This is because of the spatial distribution of the resource. Consider a transfer of 50 consumptive units from (3) to (1). This transfer would create a binding constraint at user (2)'s point of diversion. That is, the stream's flow would now only be sufficient at (2) to supply (2)'s diversion requirement. It would no longer be possible for (2) to buy water from a downstream user or for downstream users to supply to points above (2). The potential for transfers to produce negative externalities,<sup>16</sup> either through the violation of third party rights or the impairment of others' ability to trade, calls for restrictions on the free transferability of water rights.<sup>17</sup>

## 2.5 Water Transfers: Efficiency Conditions

It has been shown that, provided transfers are delimited on the basis of consumptive use, third party impairment cannot be produced via changes in consumption diversion

---

<sup>16</sup> It should be also noted transfers could produce positive externalities by releasing binding constraints.

<sup>17</sup> It can be argued that, provided there are appropriate liability rules, water markets need not be regulated and it can then be left up to the Courts to decide if transfers have violated others' rights. This proposition will be explored later in the report.

ratios. However, externalities can be produced by the creation of binding flow constraints which restrict others ability to trade. The creation of binding flow constraints could be important where regular seasonal exchanges of water occur. For the moment we assume that transfers are defined on the basis of consumptive use and trade will not produce binding flow constraints. This would be likely to be the case along streams which are, as yet, not fully appropriated. Under such circumstances the traditional micro-economic equilibrium condition for efficient resource allocation can be approached. In the context of a water market, it is where the net marginal product of consumptive use is equal across all appropriators. A mathematical proof of this proposition is found in appendix six.

The efficiency condition has, however, been derived at the expense of a crucial assumption – that transfers do not produce binding flow constraints. Where appropriator's flow constraints become binding the transferability of water rights is reduced. Hence, even where opportunities exist for trade, as marginal products of resource use differ across users, trade may be prevented. In this case a system of transferable water rights could not be expected to approach traditional micro-economic efficiency conditions: that the marginal product of resource use is equal across all users.<sup>18</sup> Rather, optimal efficiency conditions will be constrained within the limits placed on transfers produced by binding flow constraints.

## 2.6 Water Transfers: Prior Appropriation

Under prior appropriation when the water supply is insufficient to meet the needs of all water right holders, senior appropriators may ask junior water right holders to cease or reduce their withdrawals. This action would violate the efficiency

---

18 For a more complete discussion on the efficiency conditions regarding water transfers see Hartman L. M. and Seastone D. A. Efficiency Criteria for Market Transfers of Water in Water Resources Research Vol. 1 No. 2, 106-111.

condition, that the net marginal product of consumptive use is equal across all appropriators. The conventional rebuttal to this possibility is that junior right holders could restore marginal equality conditions by leasing water from senior right holders. It has been suggested, that if, because of drought conditions, flow constraints become binding, it may not be possible to restore marginal equalities through water leasing.<sup>19</sup> However, it should be noted that under prior appropriation, prices will be risk adjusted to reflect the reliability of supply. In a market context, the effect of drought conditions and location on the supply of water will be accommodated in the price paid for different rights. Provided prices are risk adjusted, drought conditions need not violate efficiency conditions.<sup>20</sup>

Burness and Quirk (1980) argue that where market transfer of water is restricted, the doctrine of prior appropriation will create additional inefficiencies in comparison to the doctrine of equal sharing. This is a consequence of unequal risk sharing among appropriators. They propose that since senior appropriators face more desirable probability distributions over stream flows they will tend to divert more water and build larger diversion capacities vis-a-vis junior appropriators. In order to abstract from diversion costs, Burness and Quirk assume these to be sunk and thus they need only consider revenue. They assume that the marginal productivity of water use is decreasing. Since, at capacity and during times of low flow, the senior appropriator will divert more water than the junior appropriator, the senior appropriator's marginal revenue will always be less than that of the junior appropriators. Aggregate revenue could be increased if the marginal productivity of water use was equal across both appropriators. This would be possible if river flow was divided equally among the users as it would be under the doctrine of equal

---

19 Johnson et al. 1981. The Definition of a Surface Water Right and Transferability Journal of Law and Economics 26: 273 P282.

20 per com John Wilkinson

sharing. Thus where transfers are restricted, the doctrine of prior appropriation creates additional inefficiencies.<sup>21</sup>

## 2.7 Water Transfers: Instream Rights

Instream rights are non-consumptive use rights to instream flows. These can potentially reduce the transferability of traditional consumptive rights. An example of such a right is the provision of water for anglers. To see how instream rights can reduce the transferability of traditional rights, imagine the provision of an instream right to 250 units of water between user (1) and user (2) in figure one. This creates a binding constraint at diversion point (1). In fact, any transfers from a point below the instream right to a point above the instream right will now impair the instream flow right. Hence, the introduction of an instream right reduces the transferability of existing rights.

The effect of instream rights depends on their location. Instream rights located either at the head of a stream or at the bottom of a stream would have no affect. At the head of the stream there are no traditional users above the right to demand the transfer of other consumptive rights, while at the bottom of a stream there are no traditional users to initiate transfers. At points between the two extremes the affect of instream rights will be site specific. The exact effect on the transferability of other rights will in part depend on the number of rights located

---

21 For a rigorous prescription of this argument see Burness H. Stuart and Quirk James P. Water Law Water Transfers, and Economic Efficiency: The Colorado River Journal of Law and Economics 23:111-134 P.119-121. Clearly, based on our previous analysis, Burness and Quirk have assumed transaction costs are zero.

above and below the instream right. It will also depend on the relative demand for consumptive rights by potential users above and below the instream right, and how this varies in response to changing economic conditions.<sup>22</sup> The exact effect of instream rights on the total economic value of a water resource is unclear. Where instream rights are purchased, it can be argued the aggregate value of the resource has increased. After all, the rights were purchased from willing sellers by willing buyers who valued the resource more highly than the seller. However, the argument does not consider the effect the purchase will have on the transferability of existing consumptive rights. As with the affect of instream rights on transferability, the affect on aggregate economic value will be site specific.<sup>23</sup>

## 2.8 SUMMARY

The way in which property rights to water are structured has important implications for the avoidance of externalities and the efficiency of a water allocation system. The problem of flow variability can be overcome either by the doctrine of equal sharing or prior appropriation. Prior appropriation is superior to equal sharing as it encourages the full use of the resource and has lower transaction costs.

---

22 For a more complete discussion on the problems generated by the introduction of instream rights see Livingston M L and Miller T A A Framework for Analysing the Impact of Western Instream Water Rights on Choice Domains: Transferability, Externalities, and Consumptive Use. Land Economics 62(3): 269-77 and Anderson T L and Johnson R N The Problem of Instream Flows Economic Inquiry 24: 535-554.

23 Ibid. p.275

Where rights are defined on the basis of diversion alone, it is likely transfers will violate third party rights. Specifying rights on the basis of consumptive use will not avoid all externalities as, where transfers create binding constraints, the ability of third parties to transfer rights will be impaired. The introduction of instream rights is also likely to reduce the transferability of consumptive rights. Where the transfer of rights has been impaired, the traditional micro-economic efficiency condition that the marginal product of resource use is equal across all users is unlikely to be approached. Under the doctrine of prior appropriation, where the transferability of consumptive rights has been impaired, unequal risk sharing among water right holders creates additional inefficiencies in comparison to the allocation of water under the doctrine of equal sharing. Because of the potential externalities created by water right transfers, the free transferability of rights may need to be restrained.

The theoretical framework developed above is a useful tool for designing policy initiatives aimed at introducing transferable water rights in New Zealand. For example, we know that, even where rights are delimited on the basis of consumptive use, transfers can still produce externalities. This could suggest that the liabilities of parties involved in a transfer have to be more clearly stipulated, or perhaps institutional arrangements are required to ensure transfers which would produce third party impairment can be stopped. However, how do we know which alternative is likely to be most cost effective? Is third party impairment likely to be a problem in practice? A way of beginning to answer these questions is to examine the actual operation of a water market. The next section presents an empirical analysis of the mining privilege system of allocating water.

### 3.0 THE MINING PRIVILEGE SYSTEM OF WATER ALLOCATION:

#### AN ECONOMIC ANALYSIS

##### 3.1 Introduction

The first step in analysing the mining privilege system of water allocation is to acquire an understanding of the property right arrangements which existed and how these evolved. Property rights consist of a set of rules which mediate the relationships among economic actors and between the actors and their environment. Thus property right arrangements present economic agents with a structure of constraints, opportunities and incentives with which to guide resource use decisions.<sup>24</sup> Understanding how the property rights to water were defined not only provides us with a description of the water allocation system but also an appreciation of how it was likely to have operated.

As the economic analysis in the previous section has demonstrated, we can expect different outcomes from different property right arrangements. This is because the transaction costs of the different property right arrangements differ.<sup>25</sup> By combining the economic analysis with the description of the mining privilege system of property rights, we will, in effect, be forming a series of hypotheses. That is, given particular property right arrangements, we can predict certain outcomes.

---

24 Hide P Rodney Property Rights and Natural Resource Policy 1987. Published by the Centre for Resource Management.

25 An objective of resource allocation is to approximate, as cheaply as possible, the result a market would bring about if transactions costs were zero. See Galabresi G Transaction Costs Resource Allocation and Liability Rules – A Comment Journal of Law and Economics 11:67-73.

However, all predictions are fallible.<sup>26</sup> One of objectives of this study is to check these predictions against empirical experience. The analysis proceeds with a brief summary of the property rights structure to water under the mining privilege system. By combining the property rights structure with an economic analysis a series of predictions concerning transferability, externalities, transactions costs, efficiency and equity are made. A summary of the evidence supporting or refuting these hypotheses is then examined. Throughout the text the footnotes are designed to refer the reader to areas in the appendix where the issues presented are examined in greater detail. The analysis concentrates on the period between 1865 and 1926 as this was the period for which data was available. It is also by far the most interesting period. Water was transferred from miners to farmers, creating the potential for third party impairment via changes in diversion consumption ratios.

### 3.2 Mining Privilege System Central Otago: Outline of the Property Rights Structure

Mining privileges with respect to land and water use were overseen, in both an administrative and judicial capacity, by the Warden's Court. The privileges established a framework of rights which determined how water and land could be used for mining purposes. The Court was constituted in the early 1860s with the

---

<sup>26</sup> The predictions are formulated by using the method of rational reconstruction. The method is based on the premise that individuals act rationally in response to constraints, opportunities and incentive structures they confront. However the method of rational reconstruction, as it is used here, is based on a narrow definition of rationality. The common dominator of individual choice domains is assumed to be personal gain, and this takes precedence over other motivating factors. Individuals will differ as to what motivates them and hence what they consider to be rational. This is one of the reasons why predictions made here are fallible. The task of the study is to check the predictions.



beginning of the gold rush in Central Otago. It heard all litigation concerning contracts, torts, and disputes over mining privileges. This included hearing all applications for, and objections against, the granting or alteration of mining privileges in respect to water. Initially, within its jurisdiction, the Court held similar powers to a Magistrate's Court, and the Warden was often the District Magistrate. However, the Court's powers were extended when, in 1898, the Mining Act removed the Supreme Court's jurisdiction over all matters within the Warden's Court, except where the cause of action affected the title to land. In addition to these extra powers, towards the turn of the century, the opportunities of appeal from the Warden's Court were gradually restricted. The last Warden's Court, at Cromwell, closed in 1971.<sup>27</sup>

Outside the administrative system, the structure of property rights which delimited individual choice domains, and hence the opportunity set for water resource use decisions, had the following key characteristics:

- water allocation was based on prior appropriation : first in time meant first in right in periods of low flow;
- water rights were defined on the basis of the quantity diverted;
- conditions specified in the water right could be changed by the warden. However, all proposed changes were open to objections from other water right holders<sup>28</sup>;

---

27 A more comprehensive discussion of the functions of Warden's Court, and its jurisdiction can be found in appendix one, page two.

28 See Appendix One 1.1 The Warden's Court : Administering Water Allocation

- every water right specified the purpose for which water was used. Subject to objections, the purpose could be changed. However, where the right was transferred from mining to irrigation half the water was to be made available for use by miners<sup>29</sup>;
- for non-use or not abiding by the conditions specified on a water licence, the licence could be forfeited;
- to avoid forfeiture a water right holder could apply to Warden's Court for 'protection'. Unless there were 'special circumstances' protection could not be granted for periods exceeding 12 months<sup>30</sup>;
- subject to conditions stipulated by the Warden and the compensation of land owners, statutory rights of easement for water races were granted;
- the mining acts made provision for instream flows;
- a water right could be sold in part or in whole and a right holder was entitled to sell or lease water.<sup>31</sup>

The water resource was initially at the sole disposal of the mining industry. In the last two decades before the turn of the century, large leasehold properties were subdivided. This put increasing demand on the water resource from pastoralists wanting to use the water for irrigation. Legislative amendments allowed the water to be used for irrigation purposes and, as the mining industry went through a series of

---

29 See Appendix One 1.2 Specification and Variation of Rights

30 For provisions pertaining to protection and forfeiture see Appendix One 1.4

31 Ibid 1.3

contractions and expansions, water was transferred into agricultural use. The state, in the first two decades of this century, in an attempt to gain control of water allocation for the development of community irrigation schemes, bought key water rights and made legislative changes which constrained the transfer of water separate from land.<sup>32</sup>

### 3.3 Mining Privilege System: The Expected Outcomes

Contemporary theory of transferable water rights suggests that the mining privilege system of water allocation would present major obstacles to the transfer of water separate to land. Rights were specified on the basis of diversion; there was no provision for the Warden to evaluate historical consumption. Thus, transfers of water via changes in the point of intake would be likely to cause third party impairment and would be keenly contested. Changes in purpose from mining to irrigation would also have altered the consumption-diversion ratio along streams. The ad hoc provision, protecting miners interests, to release half of the water for use by other miners when rights were transferred from mining to irrigation, would have helped avoid some third party impairment from changes in purpose. However, it is unlikely all mining operations had return flow coefficients of 0.5 and thus a change in purpose would be likely to cause third party impairment. More generally the transfer of water separate from land would have possibly been obstructed by the creation of binding flow constraints, these being produced by instream rights<sup>33</sup> and the drought conditions typical in Central Otago.

---

32 Ibid. 1.0, and 1.6.

33 In the first decade of this century, under considerable pressure from farmers, the Warden's Court revoked instream rights. This suggests instream rights had a significant influence on the water resource allocation. Because of the lack of data on instream rights it has been possible to analyse their impact on transferability.

Potentially the most important obstacle to market transfers were the provisions for forfeiture. Any right holder could file a suit for forfeiture of another right. With a successful forfeiture, a water right was effectively cancelled. This meant inferior rights moved up a step in the priority ranking and gained access to additional water in times of low flow. The opportunity for forfeiture presented itself where appropriators disregarded conditions attached to their rights or an appropriator, usually a mining operation nearing the end of its life expectancy, neglected to use its right for a period exceeding one month. The possibility of forfeiture presented the individual with an alternative to market transfer to gain access to additional water. All an appropriator had to do was wait for the opportunity. However, while waiting, it was possible another individual or company would actually purchase the right.

The probability that an individual would choose forfeiture rather than a market transfer would depend on how often the opportunity for forfeiture presented itself, competition from other buyers, the likelihood of objections to the changes in points of intake required for market purchases, the chance that a forfeiture would be successful and the distributions of costs and benefits of the alternative means of transfer. With forfeiture, individuals could share in the costs and benefits of transferring water, whereas, with market exchanges, costs and benefits would be concentrated with the individuals concerned. Provided that the number of right holders along a watercourse was not so great as to present large transaction costs to organisation and to substantially reduce any share of forfeited water, forfeiture would be an attractive means of resource transfer. This would be reinforced by the obstacles to market transfers already discussed.

However, water right holders could not guarantee that they would share equally in the proceeds of forfeiture. Their share would depend on the water deficit in times of low flow experienced by those rights ranked between them and the forfeited

right. Where such deficits were large, lower priority rights might only obtain a small fraction of the forfeited water. It is also possible that a forfeiture could result in some lower priority rights obtaining less water than they did prior to the forfeiture. This would be the case where the first few rights ranked immediately inferior to the forfeited right had considerably lower return flow coefficients than the forfeited right, and they had sizeable water deficits in times of low flow. Thus suits for forfeiture could generate litigation involving more than two parties.

The potential for forfeiture to generate complex and protracted litigation would mean such transfers entailed large transaction costs. However, it is likely the alternative means of transfer, market exchange, also faced large transaction costs. The potential for third party impairment from changes in diversion-consumption ratios would also involve considerable litigation. The advantage forfeiture would have over market transfer is that the price of the water would be zero. However, regardless of the means of transfer, the likelihood of litigation would ensure that transfers of water separate to land would entail large transaction costs.

Because of the obstacles to market transfers and the provision for forfeiture, it is unlikely water would have been used in an efficient manner.<sup>34</sup> The prospect of forfeiture would ensure water right holders used their full allocation of water. It would provide a disincentive to conserve water. It would also provide a disincentive to lease water as this could provide grounds for forfeiture. Because of the restrictions on transfers between appropriator's, risk would be shared unequally among right holders. As Burness and Quirk argue, this implies additional inefficiencies in comparison to allocating the water via the doctrine of equal sharing.

---

34 The term of efficiency requires an objective function. At this stage in the analysis it is being used as a general concept.

Combining the property rights structure under the mining privilege system with contemporary economic theory of water transfers generates a series of expected outcomes. Both forfeiture and market exchange had a blend of factors for and against them as preferred methods of transferring water separate from land. Without intensive empirical investigation it is impossible to say a priori which would be more common. However, we could expect water transfers to cause third party impairment. Externalities could occur either where water was transferred via forfeiture or market exchange. Both could potentially change diversion-consumption ratios injuring third parties. The litigation produced by either form of transfer would generate large transaction costs. Because forfeiture provides a disincentive to conserve water and market transfers were constrained it is unlikely water was used in an efficient manner. Nor would the system be equitable. While the fear of forfeiture would ensure water was used wastefully, constraints on transferability would deny individuals access to water. In the proceeding analysis evidence will be examined which either refutes or supports the above predictions.

### 3.4 Pattern of Water Transfer

One of the most notable features about water allocation in Central Otago is that all the available water was allocated within just over a ten year period, between 1860 and 1871. The water came from tributaries flowing into the Clutha River and its main tributary the Kawerau River. These rivers were inaccessible as a source of water. The rapid exploitation of all the available water is consistent with the simplicity of the allocative mechanism used - prior appropriation. This allowed miners to fully use all the available water, all year round. This was particularly evident when the Otago Catchment Board audited mining privilege water rights between 1969 and 1971. They found 728 water race licences current. In many instances the board found farmers held rights to excessive volumes of water, only available in winter or at peak spring flows. As two or more farmers were often

located along a race the 728 water race licences could have generated over 2000 applications for water rights.<sup>35</sup>

It has been and still is common to transfer water rights in association with the sale of a block of land or sell water, itself, from races. Many of the water rights, before the turn of the century, were issued to 'waterrace' or 'watercourse' companies which sold the water to miners for sluicing purposes. As mining activity declined a few of these companies sold water to farmers for irrigation. The most well known of these was the Cromwell Development Company which operated until 1935. By then the largest player in the water market was the State which had constructed several community irrigation schemes and sold water, at subsidised prices, to farmers; the schemes are still operating today. The most common way in which water rights are transferred among farmers today is with the subdivision of, or sale of, a block of land.<sup>36</sup>

As argued above, forfeiture was an alternative means to market exchange for transferring water separate from land. However, it was not possible to say which would be preferred. Preliminary data from the Blacks Wardens' Court, one of six key Warden's Courts in Central Otago, suggests forfeiture was slightly more common than market transfer. The Warden recorded only applications to divert water to new locations via changes in the point of intake. It was not possible to say how many of these reflected market exchanges without further extensive research. However,

---

35 There are also 139 mining privilege licences in respect to water held by the Dunedin City Council. See Gillies A J. Notes on Mining Privileges Otago Catchment Board Report W78/78. Private water rights in Central Otago were valued at roughly \$80 million in 1967 per com L W Hinchey former farm valuer in Central Otago.

36 See Appendix Two 1.1 Appendix 4 contains a copy of a mining privilege licence in respect to water. The document contains numerous transfers of water in association with blocks of land.

most of the alterations occurred in periods where mining companies were amalgamated and water was transferred from mining to irrigation, thus many of the alterations will reflect market exchanges.<sup>37</sup>

It is clear both alterations in the point of intake and forfeitures responded to the degree of water scarcity. In periods where economic activity made increased demands on the water resource, alterations in the point of intake and forfeitures both reached peak levels. They also responded to statutory provisions extending the grounds for protection and a fine in lieu of forfeiture. When these provisions were introduced, in the decade before the turn of the century, the number of forfeitures rapidly declined while the number of alterations in the point of intake rose dramatically.<sup>38</sup>

### 3.5 Externalities: Third Party Impairment

The Warden's court case history examined provides substantial evidence that changes in purpose, forfeitures and alterations in the point of intakes caused third party impairment through changes in consumption diversion ratios.<sup>39</sup> Data from the Blacks Warden's Court, indicates third party impairment presented major obstacles to the transfer of water separate from land.<sup>40</sup> On average, over a fifty year period, 70 percent of the attempts to transfer water via shifts in the point of intake were objected to. Probably the most striking evidence that the variation of rights caused third party impairment through changes in consumption-diversion ratios, comes from

---

37 Ibid 1.2

38 Ibid

39 See Appendix 2 1.3.1 to 1.3.4.

40 Ibid 1.2

41 A copy of the petition, and minutes of mines committees which examined the petitioners can be found in appendix three, also see appendix 2, 2.3.5.



a petition to parliament in 1919.<sup>41</sup> A group of 21 farmers complained about the affect changes in purpose had on existing irrigation rights. They requested that all rights changed from mining to irrigation should lose their priority relative to other irrigation rights. The farmers request was turned down. It would have been contrary to the State's interest. At the time the State was purchasing water rights from mining companies to use in community irrigation schemes.<sup>42</sup>

One of the most interesting points to emerge from the analysis of case history is that, where transferable rights are defined on the basis of diversion, individuals have an incentive to violate others rights.<sup>43</sup> By shifting the point of intake downstream, an appropriator may gain access to a larger volume of water than that consumed at the previous location. This is because tributaries between the old and new location will supply additional water in times of low flow. Thus, where a market exchange alters the point of intake, and more water will be obtained at the new point of intake, it is in the interest of both parties to define the transfer solely on the basis of the quantity diverted. Along a fully appropriated stream this will be likely to cause third party impairment.

Another interesting point to come out of the analysis of third party impairment is that the likelihood that changes in purpose would be objected to depended on the volume of water involved. Virtually all changes in purposes which involved large rights were objected to, whereas those involving small rights were not.<sup>44</sup> An explanation for this disparity is that, where alterations involved large quantities of water, effects on other appropriations rights are highly visible, however, with small quantities of water, third party impairment may be imperceptible.

---

42 See Appendix 1, 1.6.

43 Appendix 2, 2.3.1

In a case cited in appendix two, the State objected to ten applications to change purpose, simultaneously placed, all involving small quantities of water in the same catchment, only to find the appropriators involved had used the water illegally for many years for irrigation purposes. In aggregate, the variation of the ten rights was viewed as having a substantial affect on the State's water right. However, the impact had already occurred unperceived, as the ten rights had gradually, over a period of time, been illegally used for irrigation purposes.<sup>45</sup> The problem is one of gradual and imperceptible short-term changes culminating in concentrated long-term impacts.

### 3.6 Transaction Costs

It is clear from court data and case history the mining privilege system of water allocation produced large transaction costs. The majority of attempts to transfer water separate from land, or alter the purpose of use, met with objections from third parties. In one case, in order to secure the purchase of a right, parliament was successfully petitioned to alter the grounds for forfeiture. In another case, in order to secure a change of purpose, a miner deliberately applied for protection. The grounds on which the miner applied meant that if the judge granted protection a change of purpose would have been sanctioned. The application involved the miner in extensive litigation. In another case, to avoid forfeiture in order to sell water rights to a willing buyer, an appropriator employed a 'caretaker' to make it appear the rights were still in use. Water was so valuable in Central Otago, individuals were willing to incur large transaction costs to avoid losing rights or to acquire rights.<sup>46</sup>

---

44 Appendix 2, 2.2

45 Ibid 2.3.4

46 Ibid 2.3.1 - 2.3.5

The additional powers granted to the Warden's Court, except where the cause of action affected the title of land, indicates litigation over water rights did indeed produce large transaction costs. The powers were granted to the court in 1898.<sup>47</sup> This was at the end of a decade which saw record numbers of forfeitures and disputes over the alteration in points of intake.<sup>48</sup> The 1898 Mining Act states that the additional powers were granted;

"For the purpose of enabling the Court the more effectually to exercise the jurisdiction and powers conferred upon it by the act, and to enforce obedience to its orders and to punish disobedience thereof, it is hereby declared that, in so far as no sufficient provision in that behalf is elsewhere contained in this Act, the Court and the Warden thereof shall be deemed to have and may exercise all the powers of the Supreme Court or a Judge thereof."<sup>49</sup> (emphasis added)

### 3.7 Efficiency

It was argued in the first section of the report, that as transaction costs grow equilibrium conditions move further away from a efficient outcome. That is, the larger are transaction costs, the less likely it is that resources will move to those who place the highest value on them. Different property right structures produce different transaction costs. Under the mining privilege system of water allocation, in order to avoid forfeiture, appropriators were encouraged to use water without

---

47 See Appendix One 1.1

48 See Appendix Two

49 Mining Act 1898 S 274

regard to waste. If appropriators did not use their water rights or any portion of their right, the unused water could be forfeited. In a case cited in appendix two a miner kept his dredge operating purely to protect the transferability of his water rights.<sup>50</sup> The property rights structure under the mining privilege system created large transaction costs and provided appropriators with a disincentive to conserve water.

It was argued in the first section, that where the transferability of rights is restricted, prior appropriation will lead to additional inefficiencies in comparison to equal sharing. This is because risk would be shared unequally among appropriators. By the end of the first two decades of this century, the state had placed considerable restrictions on the transferability of water rights separate to land.<sup>51</sup> The last major transfer of water rights separate to land took place with mortgage sales in the 1930s.<sup>52</sup> Given the restrictions placed on transferability we would expect risk to be unequally shared among appropriators and inefficiencies to result.

There is evidence to suggest that today risk is indeed shared unequally among appropriators. Generally, only appropriators who hold high priority rights, or are on community irrigation schemes, their operation dependent on high priority rights, can risk investing in efficient irrigation methods. This is because the priority ranking of senior appropriators guarantees them a reliable supply of water, whereas junior rights may have only an intermittent water supply. In addition, the senior appropriators often only allocate a portion of their water to more efficient

---

50 See Appendix 2, 2.3.3

51 See Appendix 1, 1.3

52 Per com Brian Mooney (Otago Catchment Board Officer, who oversees the operation of mining privileges and has audited all existing rights.

irrigation techniques. This is because of the diseconomies of scale involved in using these techniques. Thus, an opportunity exists to increase aggregate farm revenue by sharing water out among appropriators.<sup>53</sup>

### 3.8 Equity

Under the mining privilege system, once streams were fully appropriated, means of access to the resource was limited as the potential for third<sup>party</sup> impairment created obstacles to transfer. At the same time, the threat of forfeiture meant on occasions that appropriators wasted water to ensure others could not lay claim to it. Thus, those who may have valued the resource more highly than existing users were denied access to the water. Today, along fully appropriated streams, individuals still have very limited access to water resources. They can either acquire water by purchasing land with an associated water right or wait until a right is cancelled. A way to provide a means of access to water resources for those who value the resource more highly than existing users, is to introduce a market.

It can be argued, where the means of access to a resource requires people to participate in a market, their ability to secure the resource will be dependent on their income, and thus people on low incomes will be denied access to the resource. However, what people can afford may bear no relation to what the resource is worth to them in terms of future income. Agricultural use of water has a rapidly decreasing marginal product. This is why under prior appropriation where transferability is restricted, water could be shared out to increase aggregate revenue. The marginal value of water is worth more to junior right holders who have little water in times of low flow than it is to senior appropriators who have an

---

53 See Appendix 2, 2.4

abundant supply of water. The expected income stream from the resource is higher for junior appropriators than for senior appropriators. Thus, junior rights holders would be willing to pay more for the resource than senior right holders as they place a higher value on the resource. Provided prospective abstractors could gain access to finance, water resources would be transferred. Individuals who formally lacked a means of access to water would become better off in absolute terms. In aggregate, the value of the resource has been increased as it has been transferred to people who place the highest value on it. As the water has moved to those who value it most highly, the resource distribution is now more equitable.

### 3.9 Summary

Combining the economic theory of transferable water rights with the property right structure under the mining privilege system, we were able to make several predictions about how the system was likely to have operated. The central prediction made was that the variation of rights under the mining privilege system would be likely to cause third party impairment. Indeed, major externalities were created by forfeitures, changes in the point of intake and changes in purpose; all of which have the potential to alter diversion-consumption ratios along streams. Without a more intensive empirical analysis, it is impossible to say what was the exact extent of the third party impairment. However, in that individuals were willing to petition parliament, it is likely third party impairment produced by the variation of rights was quite significant.

Apart from the confirmation of theoretical predictions, the analysis also made two other important findings. First, where transfers are based solely on the quantity diverted, individuals have an incentive to cause third party impairment. The second is that, where the variation of rights causes small impairments of other rights, this may not easily be perceived. However, in the long term, in aggregate, small

changes might be very significant. In the next section we will look closely at what these findings, and the confirmation of third party impairment, imply for a system of transferable water rights in New Zealand. Of particular interest is, do the findings present a case for government involvement in a system of transferable rights?

## 4.0 A MARKET FOR WATER IN NEW ZEALAND

### 4.1 Introduction

This section draws on what has been learnt from the empirical analysis of the mining privilege system, and the review of theoretical considerations in the first section, to visualise how a market for water could be organised in New Zealand. The discussion begins by suggesting a method by which unappropriated water could be allocated among competing users and a means for transferring rights which would help avoid third party impairment. How public goods such as recreational values and public bads such as pollution could be accommodated alongside a market is then examined. Finally the report looks at whether it is necessary to legislate against the potential development of water monopolies. The suggestions are not intended to be final answers; all have a number of pro's and con's. The central question the discussion attempts to address is what is the most appropriate property right structure for a water market in New Zealand? An underlying question the discussion addresses is what, if any, rationale is there for central government involvement in the management of water resources within the context of a market setting?

### 4.2 The Initial Allocation Process

Water Boards produce draft River Management plans, setting out management objectives and allocating water among competing users. The plans are often but not always open to public submission from interested groups. The revised plans then await approval from the Board members who are publicly elected. The plans set minimum stream flows designed to cater for wilderness and recreational interests, acceptable levels of pollutant discharges and the volume of water to be allocated to



consumptive uses. Since not all rivers face intense competition from different user groups, minimum flows have not been set on all New Zealand rivers. We will assume, for the purpose of the forgoing discussion, that Water Boards have been asked to set minimum stream flows and acceptable levels of water quality on all significant watercourses.<sup>54</sup> The remaining water is then available to abstractive consumptive users.

Assuming Boards have set bench mark levels for different users groups, how is the water to be allocated among users within each group? From the perspective of the Crown,<sup>55</sup> if rights are to become transferable, giving existing rights to users is, in effect, to give away the discounted value of the resource to private interests. This raises an equity issue, is it fair to give Crown resources away to private interests? However, private water users will argue that in purchasing assets which have associated water rights, they have already paid for the capitalised value of the resource. Given the precedent set by the Crown in handing over fishing resources and the arguments which will be advanced by existing water users, it is likely the Crown would proceed to give the water to existing users. For the moment we consider how rights could be allocated to abstractive consumptive users – for example, rights for irrigation or domestic consumptive use. How rights to discharge pollutants and instream rights could be managed and allocated is discussed after the market transfer process has been examined.

---

54. For example, setting minimum stream flows and water quality standards for rivers in National parks would be meaningless. The remaining water is then available to abstractive consumptive users.

55 It is important to note the 1967 Water Soil and Conservation Act does not vest ownership of water resources in the Crown. Rather it vests specific rights to use water in the Crown. See Section 21(1). It is possible ownership may rest with the Maori people of New Zealand. See Russ, M J. 1986 Water Charges in New Zealand A report for the NZCA. Waikato Valley Authority, Hamilton. The use of the word "Crown" in this text can be taken to mean a partnership between Maori and non-Maori in New Zealand.

#### 4.3 On-going Allocation

As noted in the first section of this report, Water Boards have attempted to share hardships created by water deficits equally among users. This has led to complicated interdependencies between water right holders. Different groups of rights are suspended at different flow rates and, within groups, appropriators share water in times of low flow. As argued in the first section, systems which attempt to equally share water will lead to increased specification, monitoring and other enforcement costs in comparison to a system of prior appropriation. The increased specification costs are reflected by complex management and water right allocation plans. Since plans often rely on users sharing or stopping appropriation at different flow rates, boards have created for themselves a substantial monitoring role. It appears, at least in the case of one board, the additional costs of attempting to share hardships equally has been implicitly recognised. A management plan allocating water on the basis of prior appropriation has been drafted.<sup>56</sup>

If prior appropriation is generally adopted as an on-going method of allocating water, the role of Catchment Boards in specification, monitoring and enforcement of water rights could be minimised. Where streams are not yet fully appropriated, prospective abstractors could bid on a "first in first served" basis for water

---

56. The management plan referred to is for the Kakanui River Catchment in Otago. The Plan suggests the unrestricted allocation of rights up to level of demand which can be met with an "acceptable degree of reliability". Secondary rights will then be issued on a "first on last off" basis. see Draft Kakanui River Catchment Plan. Otago Catchment Board and Regional Water Board August 1987.

rights.<sup>57</sup> Once issued, monitoring and enforcement would be up to the water right holders within each catchment. Enforcement would no longer involve monitoring flow rates and ensuring all users reduced diversion by specified quantities, in periods of scarcity. Rather it would simply entail "ensuring the last on are first off" in times of low flow. In fact right holders could develop whatever monitoring system they desired. Legislative provision could be made to allow right holders, within a catchment, to elect their own system of monitoring and enforcement. Since water right holders would pay the cost of enforcement, we would expect them to select the most cost-effective method.

Where prior appropriation is adopted as an allocative mechanism, the case for the transferability of rights is made stronger. As demonstrated in the previous two sections, where transferability is restricted, prior appropriation leads to both an inefficient and inequitable outcome. However, transfers can cause third party impairment through changes in consumption-diversion ratios. We will now look at how a transfer process can be arranged to avoid these and other externalities.

#### 4.4 Transfer Arrangements

Where a river is not yet fully appropriated, individuals who want to purchase a water right have a choice: they can either buy a right to a portion of unappropriated water or purchase a right off an existing appropriator. Which alternative is chosen will depend upon the value of the unappropriated water in comparison to the water

---

57. Water Boards could invite bids for "unappropriated" water on behalf of crown. The boards could receive a handling fee. Where bids were simultaneously placed, the tender offering the highest per unit price would receive the senior rights.

already appropriated. It will also depend on the transaction costs of the alternatives. The Crown selling unappropriated water and individuals selling appropriated water would both have an incentive to minimise transaction costs.

As demonstrated in the analysis of the mining privilege system along fully appropriated streams, water transfers or changes in purpose of water use are likely to cause third party impairment through changing consumption–diversion ratios. A way of avoiding this kind of third party impairment is to delimit rights on the basis of consumptive use wherever appropriators want to transfer rights or change the purpose of use. However, it may be argued that, along watercourses which are not yet fully appropriated, transfers are unlikely to produce externalities. Thus, defining transfers on the basis of consumptive use may appear, in many cases, to be an unnecessary transaction cost.

Defining consumptive use may not always be easy. Where water is to be exported, the new point of use being in another catchment, defining consumption is straight forward: export means the return flow is zero. Similarly many industrial processes will use and return easily-specified amounts of water. However, where water is used for irrigation and a transfer is within a catchment, estimating return flows may prove difficult. This would be particularly so where geological structures and soil types differed within the watershed. In New Mexico, where water rights are transferable, the state engineer assesses agricultural consumptive use by evaluating the area actually irrigated. This will be a straightforward task where land forms are homogenous; however, where terrain is not regular, the calculation of consumptive use may prove more difficult. However, it should be noted that even where rights are defined solely on the basis of diversion, administrative costs would not be zero. Also, where water has a high scarcity value and thus access to water necessitates a

transfer rather than the purchase of unappropriated water, the transaction cost in comparison to the price may not be significant.<sup>58</sup>

The argument that defining transfers of water on the basis of consumptive use imposes unnecessary transaction costs, where streams are not yet fully appropriated, has a major flaw. The argument is based on the assumption that along streams as yet not "fully appropriated" externalities are not likely to occur. The watercourse is, in effect, fully appropriated; the "unappropriated" portion is owned by the Crown. A transfer or change of purpose of use which increases the consumption-diversion ratio along a stream does so by imposing a negative externality on Crown rights.

As mentioned above, individuals have a choice: they can either purchase water from another appropriator or they can purchase it from the Crown. Where water rights are bought from the Crown, only the consumptive-use coefficient of the buyer needs to be defined. Consumptive use of an instream flow is zero. At first glance, the Crown appears to have an advantage in the market as it need not go to the trouble of defining its consumptive-use coefficient; that is, the Crown faces lower transaction costs than other sellers and hence could earn an above normal profit. However, as noted, the additional cost of defining consumptive use is not necessarily significant. In many cases, it may only involve calculating the area which will be irrigated. Also, selling water will not be a costless process for the Crown. It has to ensure the appropriate volumes of water are available at points where individuals wish

---

<sup>58</sup> In New Mexico the cost of protecting rights on the basis of consumptive use amounts to about \$1.30 per acre foot per annum. This compares favourably with the market price of water which typically approaches \$2,000 per acre foot per annum. See Gisser, M and Johnson, RM "Institutional Restrictions on the Transfer of Water Rights and the Survival of An Agency" in Anderson, T Led. 1983. Water Rights Scarce Resource Allocation, Bureaucracy, and the Environment Ballinger Publishing P.147.

to make a purchase. Thus, it is unlikely the Crown would face lower transactions costs which would give it a monopoly advantage in a water market.

Delimiting transfers on the basis of consumptive use has several advantages. It captures externalities which might otherwise not be caught in a notification and objection process similar to that used by the Warden's Court. In Central Otago individuals rarely objected to changes of purpose which involved small quantities of water. Changes in purpose involving small quantities of water were not perceived to generate substantial third party impairment. However, as was illustrated, many small changes in aggregate, can have a substantial effect on other rights. Defining transfers on the basis of consumption avoids this kind of impairment. The analysis of the Otago experience demonstrated that, under prior appropriation, where rights are defined solely on the basis of diversion, individuals had an incentive to transfer rights to diversion points where they could obtain additional water. The increase in consumption obtained was at the expense of third parties. Defining transfers on the basis of consumptive use makes this kind of impairment easier to detect.

One of the major advantages in defining all transfers on the basis of consumptive use is that it provides a consistent framework for market participants – the rules of the game are clear and uniform. An alternative would be the requirement that transfers be defined on the basis of consumptive use only where it was "deemed necessary", for example along streams where transfers were "unlikely to cause third party impairment"<sup>59</sup> However, how would we recognise when it was necessary to define a transfer on the basis of consumptive use? Could we leave this judgement to technical experts overseeing transfers or simply wait for externalities to start occurring? Such an ad hoc arrangement of property rights would itself produce

---

<sup>59</sup> This of course assumes negative externalities imposed on crown rights do not count as third party impairment.

unnecessary transaction costs and create uncertainty for market participants. However, defining rights on the basis of consumption does not avoid all externalities. Consumption-diversion ratios are not always easy to calculate: there is room for error. Transfers may damage other rights by reducing their transferability. Changing the point of intake may leave a third party's diversion point above the water level at which abstraction is possible. One way of capturing these externalities is to have a notification and objection process similar to that used by the Warden's Court.

However, an unrestrained objection process would merely increase rather than decrease transaction costs. Where objections were groundless, unnecessary costs would be imposed on individuals wishing to transfer rights. To minimise transaction costs, an objection process should be structured in a way which discourages groundless objections. The mining privilege system provided this incentive structure by placing an onus on individuals to arrive at a settlement before objecting, and a provision existed which allowed Wardens to award costs against individuals who made "frivolous" objections. The reason the objection process reduced the transferability of rights was that variations in rights were not assessed on the basis of consumptive use and thus transfers were likely to cause third party impairments. Where consumptive use is used as a measure of transferability, an objection process need not constrain transfers.

If we accept the need for an objection process, the immediate question that arises is what would be the institutional framework of such a process? We can imagine that liabilities, based on a no damage principle, could be assigned to parties involved in an exchange. Where a transfer could potentially damage third party rights, parties in a dispute could resort to a Court of law for the settlement of claims. Alternatively, the existing administrative procedures of water boards and the

appellant channel to the Planning Tribunal and Law Courts could be used to resolve disputes. Overseas experience suggests administrative procedures have produced lower transaction costs than judicial methods.<sup>60</sup>

A possible reason for the lower cost of administrative procedures is that the agencies involved are more familiar with water resource issues than judicial bodies. In particular, agencies involved with administering and monitoring water resources are more familiar with the technical issues involved. They also have a broad understanding of how catchment dynamics can be affected by transfers. The courts on the other hand treat all disputes on a case by case basis without necessarily having regard to broader issues, such as catchment dynamics. Hearings before water boards would act as information brokerage points. Public information about the dynamics of catchments would be increased, and individuals wanting to sell or buy rights would have a better idea of the opportunities which existed.

The involvement of water boards in resolving disputes could be objected to on the grounds that boards will obstruct transfers. That boards have a history of resource planning and allocation and thus would be unlikely to be happy to leave allocation decisions to the market. However, the only principle on which a board could reject a transfer is that the transfer would damage a third party. If boards did obstruct transfers, parties involved in an exchange could appeal to the Planning Tribunal and then a Court of Law. Further, it should be remembered that Water Boards are elected bodies. Where boards unnecessarily obstruct transfers they could be voted out of office.

---

<sup>60</sup> Gisser, M and Johnson R M. Supra Note 5. P.146



#### 4.5 Instream Rights : National Versus Regional Allocation

It was assumed earlier that Water Boards in an initial allocation plan have set minimum stream flows for wildlife and recreational activities. However, the question should be raised, why should individuals or groups not purchase these rights themselves? The answer is they can; however, instream rights suffer from the free rider problem. It would be too costly for private parties to contract to exclude non-payers from enjoying the resource.<sup>61</sup> This suggests instream rights will be undersupplied by the market. Hence the assumption that instream rights could be initially set by the Water Boards, as is currently the practice.

The volume of instream rights has to be responsive to changing values within society. Instream rights have a national interest component. People located all over New Zealand and in other parts of the world place value on the mere existence of living organisms in our streams and rivers, even if they never see them. A way of taking the national interest component into account is to vest instream rights in the Department of Conservation. The department could then be responsible for supplementing instream rights by purchasing unappropriated water or existing consumptive rights. The volume of instream rights could then be responsive, through political processes, to changing social values.

---

61 Far from estimates made by farmers and catchment board staff, it appears the price of high priority right in Central Otago ranges between \$100,000 and \$200,000 per head. (1 head = 100m<sup>3</sup>/hr). It is hard to imagine environmental groups in New Zealand affording this kind of price.

There is no guarantee that the Department of Conservation would be able to select the volume of instream rights for which society is willing to pay. However, political and economic feedback mechanisms could act as a guideline to the Department. If an oversupply of instream rights was produced, as water prices reached peak levels, consumptive users would put pressure on the Department to sell or lease water. In the converse case, an undersupply, environmental groups would put pressure on the Department to buy additional rights. The public good aspect of instream rights means, to a large extent, we have to rely on political processes to achieve an optimal supply.

The exact supply of instream rights would depend on the relative political powers of competing user groups – consumptive users and the general public. Where a user group has power which exceeds the value the community places on the resource a misallocation of the resource could occur. Since consumptive users face both concentrated costs and benefits, we would expect them to be more organised than users of instream rights, who face dispersed costs and benefits. The advantage of vesting instream rights in the Department of Conservation is its conservation advocacy role could help balance the stakes. Since instream rights have both a national and regional interest component, it is important that the Department is held accountable to both parties for any allocation of instream rights. Institutional structures which reflect the actual value people place on instream resources rather than their relative political power are needed. The review of accountability structures will be a central task of those reviewing the resource use statutes. It is beyond the scope of this study.

If instream rights have a regional interest component, why not leave their allocation up to a regional body? Allocation of instream rights on a regional basis faces two major problems. A regional body would have to receive funds from central

government to ensure it could purchase the national interest component of instream resources. Since funds would be channelled from two different sources, both players, central government and regional government, have an incentive to persuade the other to bear all the costs of purchasing instream rights. For example, a regional body could hold off supplementing instream rights in anticipation that central government, under pressure from environmental groups, would step in and make the necessary purchase. Incentive structures would have to be constructed which would prevent such stand off situations occurring and ensure both parties paid their fair share. Developing this kind of neutral incentive structure may prove very difficult.

The second problem arises because of relative size of the portfolio of instream rights a region is likely to hold. Where instream rights are held by the Department of Conservation their supplementation within a region can be made without additional expenditure by reallocating rights within the national portfolio. Rights no longer considered to have a high value for instream use can be sold to purchase higher valued instream rights. In contrast, where instream resources are allocated on a regional basis, flexibility is reduced as the smaller size of regional portfolios will present fewer opportunities to reallocate rights. Rather, additional purchases may have to be made. Allocating instream rights through a centralised body will produce economies of scale which generate flexibility not available to small regional bodies.

Minimum instream flows are currently supplemented through National or Local Conservation Orders. As a method of obtaining instream rights, such orders suffer from several drawbacks. First, they pertain to unappropriated water. This places

limits on their ability to supplement minimum flows.<sup>62</sup> Another drawback is their inflexibility. The Conservation Order for the Rakaia River took over 5 years to put in place. Revoking an order may prove just as difficult. In a market context, once the initial stock of instream rights had been set on the basis of minimum flow rates, flexibility would be achieved by the buying, selling or leasing of instream rights. It could be argued that a major constraint on this process would be financial. However, a base stock of instream rights would have already been allocated to the Department of Conservation. Its job would be reallocating or supplementing rights, not purchasing an initial stock. Also, as the Tribunal and Court hearings over the Rakaia case have shown, Conservation Orders are far from costless. In a market context all rights acquired through a Conservation Order would still have to be purchased, otherwise instream users would have an unfair advantage in the market. Conservation Orders are redundant in a market context.

In the first section of the report it was shown how instream rights may reduce the transferability of existing consumptive rights. However, the impact of instream rights on aggregate economic value is unclear. The reduction in economic value from restrictions on transferability of consumptive rights could be offset by the additional value of the instream right. Where the proposed purchase of instream right was likely to restrict the transferability of existing rights, we would expect

---

<sup>62</sup> For example, the mining privilege system fully appropriated many streams in Central Otago to the point where summer flows are absent. Since the Otago Catchment Board is unable to cancel water rights issued as mining privileges, instream flows could only be supplemented by the purchase of rights for instream use.

Water Boards to turn down such transfers. This would be consistent with a Water Board's regional perspective. Water Boards are elected locally and are thus more likely to put regional interests ahead of national interests. Indeed, in Colorado where state water agencies have been responsible for the appropriation of instream rights, the status quo has tended to be preserved. Instream rights have been acquired either near headwaters or along unappropriated streams; in these locations they do not affect the transferability of existing consumptive rights.<sup>63</sup>

A way of ensuring Water Boards do not obstruct the purchase of instream rights is to use a restrictive interpretation of the no damage principle. Where the purchase of instream rights would place restrictions on potential future transfers of consumptive rights, the no damage principle would not be applied. However, where an instream right was to obstruct regular seasonal transfers of water, the no damage principle would still apply. Again, where the over-supply of instream rights was lowering the aggregate economic value of a water resource, the Department of Conservation would be under pressure to dispose of unwanted instream rights.

#### 4.6 Pollution

It has not been possible within the context of this study to examine pollution issues in depth. The mining privilege system of water allocation made few provisions with respect to pollution. Where discharges detrimentally affected other consumptive users, with the exception of town water supplies, parties discharging waste were not liable for damage. No constraint was put on the overall volume of pollution

---

63 Livingston M L and Miller T A. 1986. A framework for analysing the impact of Western Instream Water Rights on Choice Domains : Transferability, Externalities and Consumptive Use. Land Economics Vol.62 No.3 269-277.

permitted in streams. Within the time constraint of this analysis, it has not been possible to explore how pollution discharges affected the transferability of abstractive rights. Thus the comments below look very generally at how the volume of pollution is currently allocated and how this would fit into a market context.

Today, Water Boards, in conjunction with other government agencies and the public, are responsible for setting minimum water quality standards, monitoring water quality and delimiting the area of the environment to be marked off for pollution discharges. This process essentially defines the boundaries of pollution discharges in terms of consumptive use. It also sets the boundaries between user groups. Abstractive users could then transfer rights provided such transfers did not damage rights to discharge. The administrative method of allocating pollution rights could sit comfortably alongside a market process of allocating abstractive rights.

Alternatively, a market for transferable pollution rights could be developed alongside the market for abstractive rights. Water transfers would take place between the two markets, either where water was more valuable for abstractive uses than the disposal of waste or where the quota for pollution discharge had not been fully appropriated and waste disposal was the higher valued use. However, the market allocation of pollution property rights is still in a very early stage of development. In 1981 the Fox River became the first body of water in the United States for which transferable pollution rights were issued. A recently completed analysis has demonstrated substantial cost savings of pollution abatement were achieved.<sup>64</sup> However, it is beyond the scope of this study to examine whether or not similar results could be achieved in New Zealand.

---

64 Maloney, M T and Yandle B. 1983. "Building Markets for Tradable Pollution Rights" in Water Rights Scarce Resource Allocation, Bureaucracy, and the Environment Ballinger Publishing. P 311-312.

Periodically, the community could re-assess the size of the environmental domain which was to receive pollutants. Where a reduction in the volume of pollution permitted was made and transferable rights to pollute had been issued with a right of renewal, the community would either have to purchase the rights in the market or revoke them and pay compensation. Society as a whole would pay for the reduction in pollution. Alternatively, rights could be issued on the basis that if they were revoked no compensation was payable. This would reduce the security of the rights and hence the incentive to invest in pollution abatement. Where rights were cancelled, the cost of pollution abatement would fall on the consumers and producers of the offending activity.<sup>65</sup> One of the questions which will have to be addressed in the review of the resource use statutes is who should bear the burden of pollution abatement costs.

#### 4.7 Water Monopolies

The location of freshwater resources within watersheds provides an opportunity for their monopoly ownership to develop. The monopoly which would develop would be a bilateral monopoly between the monopolist, most likely to be an irrigation company, and the community of water users in the catchment. Since the number of irrigators is unlikely to be large, they could band together and force the monopolist to sell water at its short-run marginal cost, hence expropriating the capital invested in delivery systems. Alternatively, the monopoly company could stand fast and attempt to charge a monopoly price for delivery services. The situation is highly unstable and is unlikely to persist.

---

<sup>65</sup> The exact incidence of the distribution of abatement costs between producers and consumers would depend on the relative elasticities of supply and demand.

Indeed, experience with irrigation companies in Central Otago and California suggests the bilateral monopoly problem either won't develop, or if it does, it will eventually breakdown into common ownership. In the case of the Cromwell development company which supplied irrigation to farmers for the first three decades of this century, farmers successfully petitioned the State to take it over.<sup>66</sup> Farmers have then managed, on virtually all the government irrigation schemes in Central, to keep the price of water well below its real value.<sup>67</sup> Currently the government is investigating ways in which the schemes can be transferred to farmers which will ensure the State gets a return on the capital invested. The Schemes will then dissolve into common ownership. The history of mutual irrigation companies in California also suggests vertical integration between the company and farmers will develop rather than a monopoly situation.<sup>68</sup> Rather than legislate against the potential development of monopolies, it is better to wait and see if such legislation is in fact necessary.

#### 4.8 Treaty of Waitangi

It is possible that the ownership of some water resources may rest with the Maori people. Indeed, the 1967 Water Soil and Conservation Act only vests rights to the use of water in the crown. In traditional Maori society tribes could own the bed of the river or lake. It is possible, successful claims for lakes or rivers may be lodged

---

66 per.com Terry Hearn

67 Carstens (1984) Irrigation in Central Otago MWD Internal Report.

68 Private long term contractual arrangement between farmer and mutual irrigation companies provided a solution to the monopoly problem. See Rodney T Smith. The Economic Determinants and Consequences of Private and Public Ownership of Local Irrigation facilities in Anderson T L et al. 1983 Water Rights Scarce Resource Allocation, Bureaucracy, and the Environment, Ballinger Publishing.



before the Waitangi Tribunal. Such claims would not be inconsistent with the development of a water market in New Zealand. Successful claims would simply result in the transfer of property rights to their rightful owners. Furthermore, ownership would enable the Maori people to protect aspects of their cultural heritage related to water use.

#### 4.9 Summary : Policy Recommendations

The central question the discussion has addressed is: what is the most appropriate property structure for a water market in New Zealand? Underlying this core question is another: what, if any, rationale is there for central government involvement in the management of water resources within the context of a market setting?

First, dealing with the second question, there appears to be good reason for central government to play an active role in a water market. This need arises because of the public goods aspect of instream rights. Instream rights suffer from the free rider problem and are thus likely to be undersupplied by the market. If their allocation was left purely to regional water boards because of the Board's regional perspective, the national interest component in instream rights is likely to be undervalued. Also, because instream rights may interfere with the transferability of consumptive rights, regionally elected Boards would be likely to attempt to minimise their impact on consumptive rights by allocating them mainly at head waters or river mouths. The provision of instream rights could be best served by the Department of Conservation responding to changing community values by buying or selling instream rights.

The potential for transfers to produce third party impairment, even where transfers are delimited on the basis of consumption, suggests a role for a public agency in overseeing exchanges of water. The alternative, a judicial process, is likely to produce larger transaction costs. Courts are not familiar with the technical issues generated by watershed dynamics. Water Boards, with their role in monitoring catchments, are well placed to resolve disputes quickly and thus facilitate water transfers.

This section has attempted to fit the earlier examination of the theoretical literature and the findings from the empirical analysis of the mining privilege system into the framework of the New Zealand environment. Several provisional policy recommendations on what would be the most appropriate property right and institutional structure for a water market in New Zealand can now be made. These provisional policy recommendations are listed below:

- transfers of water should be defined on the basis of consumptive use.
- "unappropriated" water is held in Crown ownership;
- the ongoing process of water allocation is based on prior appropriation with individuals bidding for rights to unappropriated water;
- through a notification and objection process Water Boards could resolve disputes arising out of transfers – appeal would lie to the Planning Tribunal and then the Courts;
- minimum flows set by Water Boards would be given to the Department of Conservation as the initial stock of instream rights. The Department could supplement this stock with future purchases.

- a limited interpretation of the no damage principle could be used. This would ensure the purchase of instream rights was not unnecessarily obstructed by potential effects to the transferability of consumptive rights.

The policy recommendations are provisional because as yet the cost of introducing such reforms has not been evaluated against the benefits suggested in the report. For example, the introduction of prior appropriation in areas where water resources have been over-allocated might involve the revocation of existing rights. Social costs would then be produced as water resources were re-allocated and/or appropriators were compensated. It has been beyond the scope of this report to evaluate the social cost of introducing the market structure suggested in this section. The policy recommendations are provisional in the sense that further research has to demonstrate that the costs of introducing such a market structure are exceeded by the benefits before the recommendations lose their provisional status.

## 5.0 Concluding Comments : A Cautionary Note on Equity and Efficiency

It was argued, in the second section of the report, that the introduction of fully transferable water rights in Central Otago would increase the efficiency and equity of water resource use. It is likely equity and efficiency gains would be greatest where water has a high scarcity value; in water short areas such as Central Otago. However, in New Zealand, with the exception of Central Otago, water short areas have not adopted prior appropriation. Thus, it is not at all clear that the equity and efficiency gains from making rights transferable in Central Otago could also be achieved in other water short areas, without the introduction of prior appropriation.

As pointed out earlier in the analysis, some Waterboards have responded to scarcity by introducing a complex system of water allocation. In times of low flows consumptive rights vary according to flow rates, and special conditions on the time and place of extraction are attached to individual appropriators' rights. It is not at all clear, from the analysis in this report, that making water rights transferable in such situations, without the introduction of prior appropriation, would improve water resource allocation in terms of efficiency or equity. Indeed, the complex way that rights have been arranged may constrain or even preclude trade. If the introduction of a water market in New Zealand is to be considered as a serious policy option, the affect on equity and efficiency from making rights transferable in other water short areas needs to be examined.

**APPENDICES**

		<u>Page No</u>
A1	Mining Privileges : Property Right Structure	58
A2	Pattern of Trade, Court Records, Case History and Water Use Efficiency	70
A3	Petition to Parliament and Minutes of Gold Fields and Mines Committee 1919 on Water Rights	88
A4	Water Allocation Plans : Prior Appropriation Vs Equal Sharing	97
A5	Research Method	110
A6	Water Market : Efficiency Conditions	116

**APPENDIX ONE**

<b>Mining Privileges : Property Right Structure</b>	<b><u>Page No</u></b>
1.0 Central Otago: History and Environment	59
1.1 The Warden's Court: Administering Water Allocation	60
1.2 Specification and Variation of Rights	62
1.3 Right of Transfer	64
1.4 Forfeiture Cancellation and the Right of Protection	66
1.5 Instream Rights	67
1.6 Crown Water Rights	68

## 1.0 Central Otago : History and Environment

Central Otago has a unique terrain and climate. It consists of a series of basins enclosed on all sides by rugged ranges. The basins receive an average between 250 and 600 mm of rainfall a year. The rainfall is highly variable and the cold dry winters and the hot dry summers mean much of it is lost through evaporation. Valley basin areas seldom receive sufficient rainfall to maintain pasture growth. The Clutha River and its major tributary the Kawarau River run through the basin areas, however, because of the entrenched nature of the river courses they are relatively inaccessible as a water source. Water used for irrigation is drawn from tributaries joining the main rivers, or where possible from races which collect water at higher altitudes. The cold dry winter followed by a spring snow melt and a long hot summer, produce highly variable stream flows.

Water was allocated on the basis of prior appropriation. The simplicity of this allocative mechanism, made the rapid exploitation of the water resource possible. Between 1860 and 1871 most of the water in the Clutha River tributaries was claimed by gold miners. They often worked throughout the year, fully using peak spring flows. The state responded to the water shortage by subsidising the development of water supply schemes. Private companies and the Mines Department built storage facilities and water races, in order to sell water to miners for sluicing purposes. The water was never intended to be used for irrigation purposes.<sup>1</sup>

Irrigation in Central Otago began in 1873 when the Warden's Court granted a water right for the irrigation of vegetables. The Warden's Court administered the allocation of water resources in mining districts. The issue of a right for irrigation

---

<sup>1</sup> For a detailed discussion of the historical conflict over water use between miners and farmers see Hearn T. J. Land, Water and Gold in Central Otago 1861 - 1921. Some aspects of resource use Policy and Conflict. PHD Geography, Otago University 1981, Chapter 4.

purposes marked a major change in the policy of the Court. Before this grant the water resource was the sole domain of mining industry. However, it was not until after the turn of the century that the rapid development of irrigation began. By then the mining industry was in a decline and large volumes of water were released. The State purchased key water rights and developed community irrigation schemes. A number of irrigation schemes were also developed by private companies.<sup>2</sup>

### 1.1 The Warden's Court: Administering Water Allocation

The Warden's Court held jurisdiction over all matters arising from the operation of water rights. Before the turn of the century Wardens were appointed by the Governor, passing an Order in Council. Mining acts later than 1891 do not stipulate how the Warden's Court was constituted. However, as the Warden was often the Resident Magistrate and within the Warden's Court jurisdiction Wardens held powers equivalent to a Resident Magistrate, it is possible Wardens were appointed in the same manner as other Magistrates. They heard applications for, and objections against, the granting of Water rights. Wardens also heard all litigation concerning contracts, torts, and disputes relating specifically to mining. In 1898, with the increasing use of water for irrigation, the jurisdiction of the Court was extended to include all disputes relating to mining privileges, whether or not the parties were engaged in mining operations.<sup>3</sup>

Most water rights were issued as water race licences<sup>4</sup> which often conferred statutory rights of easement across Crown or private property. The compensation of land owners or others detrimentally affected by the grant, or exercise of a water race right was provided for by all mining acts. A notice of an applicant's intention

2 Engelbrecht, Rayds, Tavendale and Co. Limited farm management consultants Ashburton. Survey Report on Irrigation Charges, Water Quotas and Scheme Management in the Older Central Otago Irrigation Schemes p2-5. Also see Hearn supra note 30.

3 See S.102 Mines Act 1877, S261 Mining Act 1891, S254 Mining Act 1898.



to construct a water race or vary the conditions of a water right had to be posted locally and in the Gazette. People whose interests could be affected, usually land owners and other water right holders, had a specified time in which they could object to the proposed grant. Initially it was up to the applicant and parties affected by a proposal to arrive at a settlement. If agreement between the race licence applicant and parties affected could not be struck, it was settled by arbitration, or by the Warden working in conjunction with assessors. Where the Warden considered an objection to be frivolous, costs could be awarded against the objector.<sup>5</sup>

In the late nineteenth century the power of the Warden's Court was extended, and appellant channels to superior courts were restricted and more tightly defined. The first consolidation of mining legislation, the 1866 Gold Fields Act, made provision to appeal to the District Court or where there was none to the Supreme Court. The 1877 Mines Act made decisions of the appellate court final and conclusive, and provided that, where appeals were on fact alone, or fact and law, they were to be by way of rehearing. It also stipulated that the appellant was not entitled to costs of appeal unless the Court felt there were 'special circumstances'. This contrasted sharply to the 1866 Gold Fields Act which allowed for costs to be awarded as to the Judge's discretion. In 1898 appeals on fact from a summary conviction not exceeding £5 were disallowed. The same act removed the Supreme Court's jurisdiction, over all matters within the Warden's jurisdiction, except where the cause of action affected the title to land. In effect this meant the Supreme Court

---

4 Water rights could be issued under a dam licence, a drainage area licence and a tail rare licence. These water rights however, did not provide the holder with the right to divert and sell water, as did a water race licence.

5 See section 11 1866 Goldfields Act, section 98(4) 1898 Mining Act and sections 118, 1998(15) Mining Act 1926 on compensation, and see s(117), s(168) 1926 on Wardens powers to award costs.

could not direct the Warden's Court with respect to procedural irregularities. Before the turn of the century opportunities for appeal from the Warden's Court were gradually restricted and the Court gained additional powers.<sup>6</sup>

## 1.2 Specification and Variation of Rights

Each water right specified the quantity of water taken in terms of the amount diverted, the purpose for which the water was used, the tenure of the licence, the exact path of the race and any conditions stipulated by the Warden. Licences were issued for periods ranging between 15 and 42 years, depending on which mining act they were granted under. Before the turn of the century there was a nominal annual rental. All water rights held an automatic right of renewal when the term they were issued for expired. Since the water was allocated on the basis of prior appropriation the date of issue of the licence established who had prior right in times of low flows.<sup>7</sup> However no right conferred priority against an individual requiring water for stock or domestic purposes. The special status given to domestic or stock watering rights meant individuals were not obligated to acquire water rights for either purpose. In many cases farmers and other settlers simply used water running through their property, for stock watering or domestic purposes.<sup>8</sup>

6 With respect to the Court's appellate structure see Mines Act 1877, S.152, Goldfields Act S.81, S.82, S.93 Mining Act 1898 S.282, S.285. With respect to the jurisdiction and additional powers of the Warden's Court see *Hawkins versus the Slate River Sluicing Company* (1902) 21 N.Z.L.R. 517 and see Mining Act 1898 S.5, S.254(13), S294, S254.

7 Mines Act 1877 S.31. Although the priority of right to water based on chronological claim was not explicitly set out in the Golds Fields Act 1866 it was in operation as is evident from the Warden's Court registrars.

8 Appendix One (1.3.3) contains an example of where over one hundred settlers were using water for domestic purposes without water rights.

The use of water for the disposal of tailings came into conflict with the use of water for domestic use and other purposes. In accordance with the dominant role of the mining industry, early mining acts made provision for the Governor to set aside water courses for the disposal of tailings. The liabilities of parties discharging tailings was refined in 1891. The 1891 Mining Act stipulated that water right holders could not claim damages against individuals disposing of tailings. This was provided that the miners discharge point, was at least two chains above the intake point of another water right holders race. In 1898 the distance was extended to five chains. However, where the disposal of tailings came into conflict with water used for domestic purposes the interests of the mining industry took second place. Miners were not allowed to 'pollute' water taken by county council races for domestic supply. 'Pollution' was not defined in the mining acts.<sup>9</sup>

It was not until 1877 that a water race right could be granted for irrigation purposes under a mining act.<sup>10</sup> However, such a right was issued in conjunction with a water right granted for mining purposes.<sup>11</sup> An amendment in 1903 made, subject to ministerial approval, provision for a change of purpose.<sup>12</sup> This was usually granted on the recommendation of the warden. The change of purpose also carried the proviso that the licence would still carry the same priority. However, half of the water entitlement was to be made available to lower priority licences for the purpose of mining. A change of purpose to irrigation would entail additional consumption of water, as when the water was used for irrigation return flows would be reduced. Thus the provision was designed to protect other right holder's interests, primarily those of miners.

9 See s.92 Mines Act 1877, S.105(12) Mining Act 1891 and s.103, 104 Mining Act 1898.

10 The first legislation to make water available specifically for irrigation was the Otago Wastelands Act 1972. This allowed the water rights to be granted to Central Otago farmers on the same basis as rights issued for mining purposes. However this did not lessen the conflict over water resources between miners and pastoralists as most of the available water had already been appropriated. (see Hearn P. 297.)

The 1866 Goldfields Act did not make explicit provisions for the variation of water race rights, however, such alterations were provided for by later mining acts.<sup>13</sup> The licensee could alter or extend the course of a water race. In accordance with the principle of prior appropriation an increase in the quantity of water diverted was not deemed to be an alteration of an existing licence. An application to extend or alter the course of a water race was treated as if it were a new application for a mining privilege. Thus any alteration of rights was open to objection from land owners and people whose interest would be affected by the grant. The Warden held the discretion as to whether the alteration was to be endorsed on the original licence or whether it was to be issued under a new licence.

### 1.3 Right of Transfer

Water rights were deemed to be the private property of the licensee, and could be sold or assigned to other individuals. They still hold this status today.<sup>14</sup> The right of transfer, however, has had several restrictions placed on it over time. The first major restriction appeared in 1910. Transfers which would result in the aggregation of more than 20 heads<sup>15</sup> of water to any one individual were disallowed,

11 Mines Act 1877 s.31. Mining Act 1886 s.141. Water rights were issued to either holders of miners licence or people engaged in the industry. Water rights issued for irrigation, prior to the turn of the century were granted to miners for the purpose of mining and irrigation.

12 Mining Amendment Act 1903 s.5.

13 As outlined in the text the Warden held a wide range of powers. He could almost certainly have varied the terms of water rights. See the Mining Act 1877 section 11 for the earliest reference to the variation of water rights. Alterations to rights are in fact listed in the court journals prior to 1877.

14 From as early as 1866 mining privileges were deemed to be chattel interests. They could be "inherited, assigned, transferred, seized and sold under any writ of fieri facias or other writ of execution or warrant." Mining privileges in respect to water still hold this status today. (see footnotes 22 and 23).

15 One head is equal to 100m<sup>3</sup>/h of water.

except with the consent of the Minister.<sup>16</sup> Transfers were further constrained in 1919 when an amendment prevented, except with the consent of the Minister, the transfer of a water race licence which would result in the use of water on "land other than that for which it was originally granted".<sup>17</sup> In addition, the total allowable aggregation of water resulting from any transfer was lowered to ten heads. The restrictions on transfers were put in place in order to prevent the development of monopolies in water ownership.

The most recent act of parliament to specifically deal with mining privileges in respect to water, the Water and Soil Conservation Amendment Act 1971, does not cite the above constraints on the transfer of water race rights. However, the ability to transfer water separate to land has been severely restricted. Section 14(a) states that unless otherwise provided for in the principal act the holder of a current mining privilege shall, "not alter the intake of the water, or use for diverting the water any race other than the race authorised by the privilege." Section 24B of the principal Act, the Water and Soil Conservation Act 1967, provides for the variation of rights. However, any variation is treated as an application for a new right, and as a board right, the new water right would have no priority over other water rights. It would be worthless in comparison to its former status as a mining privilege. The transfer of water rights separate from land has effectively been constrained by the 1971 amendment.

Although the transfer of rights to water in isolation of the land associated with the initial granting of the licence is constrained, water right holders are otherwise free to trade water. All the mining acts carried the provision that a licensee of a water race could ".... by means of such race, to take, divert, and use a specified number of

---

16 Mining Act 1926 section 178.

17 Mining Amendment Act 1910, No 78, clause 17.

18 Section 109, Mining Act 1926.

sluice heads of water from any water course on or through or adjoining such land, in order to supply, sell, or dispose of such water ....".<sup>18</sup> Until 1971 the water could be sold for a wide range of purposes including any industrial pursuits, irrigation, domestic use and any other purpose authorised by the Minister. The Water and Soil Conservation Amendment 1971 restricted the sale of water to the purpose specified in the licence.<sup>19</sup>

In addition to the sale of water, it has always been possible to lease rights to water or transfer water rights among land owners associated with a particular race. Historically, as land was divided into smaller units, so were the water rights associated with the land. It is common today to have several water rights attached to a particular race running through a number of properties. Exchanges of shares in the initial water right is possible among these property owners. It is also possible through the adjustment of priorities among water right holders to lease water along a watercourse. However, since it is not permitted to take water in excess of that specified in a licence the leasing of water is restricted to the adjustment of water deficits in licensee's water rights.<sup>20</sup>

#### 1.4 Forfeiture, Cancellation and the Right to Protection

In addition to market exchanges, the forfeiture of rights was another means of transferring water among appropriators. A suit for the forfeiture or the cancellation of a water right, or any portion of, could be initiated by other right holders. The grounds for cancellation or forfeiture varied. Generally, however, if the licensee did not observe the conditions attached to the right or the right was unused for a specified period of time, the licence could be forfeited or cancelled. Under a suit for cancellation the claimant was claiming for the possession of the right

<sup>19</sup> Water and Soil Conservation Amendment Act 1971 s.4.

<sup>20</sup> See section 121(g)(f) Mining Act 1926.

whereas a right which was forfeited was open for public application. Since under both forms of suit the licence would lose its former priority status water was released for use for all other right holders.<sup>21</sup> If the cost of litigation did not exceed the market price of water right, holders would have an incentive to file suits of forfeiture.

To avoid forfeiture or cancellation the holder of a water right could apply for protection. Protection was limited to a period not exceeding two months in the Mines Act 1877, however, the grounds for protection were not stipulated. The Act also made provision for a fine in lieu of forfeiture. The Mining Act 1898 strengthened provisions for protection. Broad grounds were defined and the period over which it could be claimed was extended. Later acts and amendments also strengthened the provisions for protection by broadening the grounds on which it could be claimed.<sup>22</sup>

Water race licences could be revoked or abandoned by passing of law. A race could be deemed abandoned where it had been entirely unused or unused for its specified purpose for a continuous period of 12 months. A licence could be revoked by the state where the water was required for public use, however the licensee had to be compensated.<sup>23</sup>

### 1.5 Instream Rights

On the application of the occupier or owner of land, within three chains of, or adjoining a water course, the Warden could order, for general use, a quantity of

21 See section 86 Mines Act 1877, s.117, 2113 Mining Act 1891.

22 See section 86 Mines Act 1877 s.130-35 Mining Act 1898, section 33 Mining Amendment Act 1914, section 4 Mining Amendment Act 1924, s.37 Mining Amendment Act 1949.

23 1908 S188, 185, 187.

water not exceeding two sluice heads to flow in a watercourse. With increasing pressure on water resources towards the turn of the century the quantity was reduced to one sluice head. The statutory definition of the term general use meant the water was not available for irrigation or mining.<sup>24</sup> In the first decade of this century, as irrigation requirements put increasing pressure on the water resource, the Court revoked many instream rights<sup>25</sup> A landowner or occupier could also request a 'reasonable' flow of water for domestic use or stock watering. Under mining legislation what constituted 'reasonable' use was decided by the Warden. Currently this discretion lies with Water Boards.<sup>26</sup>

### 1.6 Crown Water Rights

From about the turn of the century, in order to promote an equitable distribution of water and the development of irrigation in Central Otago the Crown applied for and purchased key water rights. Major purchases of rights in 1906 were used to supply the Gollaway and Ida Valley irrigation schemes. The Earnscleugh irrigation scheme is based entirely on rights purchased from a mining company in 1920. The majority of the State's irrigation schemes today in Central Otago depend on mining privilege water rights for their operation in times of low flow.

In order to facilitate the development of irrigation and protect the State's interests the Crown made several important amendments to the law. Among these were the restrictions on the transfer of water rights outlined previously. The ability of the

---

24 Instream flows were most likely to be used by miners for domestic purposes (per com Terry Hearn). Thus these were not strictly instream rights. However since domestic use would entail limited extraction as instream flows would be required for washing, possibly waste disposal, and extraction would be periodic with large return flows, they are treated by this analysis as instream rights.

25 Per Com. Terry Hearn.

26 See section 16(2) Water and Soil Conservation Amendment Act 1971.



Minister to scrutinise exchanges meant the state could prevent transfers which were contrary to its interests. When the government acquired a water right and changed its purpose from mining to irrigation it was not subject to the provision that half the water should be made available to miners who held inferior rights. An amendment in 1920 provided that a water right could not be renewed until two months after the date of application for renewal. The state used this time to review all applications. Where a water right was required by the Crown it could be taken; however, the licensee was entitled to compensation. Under the Public Works Act 1908 Crown water rights were deemed to be not liable to forfeiture. This was expanded on by the Mining Amendment Act 1915 which included the provision that Crown water rights could not be cancelled, revoked or declared abandoned, and in 1919 Crown rights were deemed not to expire with the effluxion of time. These amendments give the Crown the opportunity to closely monitor and control the reallocation of the Otago water resource and give Crown rights a privileged position with respect to other water rights.<sup>27</sup>

---

27 Mining Act 1926 S97.  
Mining Amendment 1920.  
Mining Amendment 1915 S3.  
Mining Amendment 1919 S14.

The State could also secure water released on the surrender of a water right, see Section 3 of the Mining Amendment Act 1920. For a more indepth discussion of how the State went about securing key water rights and protecting its interests see Hearn p97-102.

## APPENDIX TWO

<b>Pattern of Trade, Court Records, Case History and Water Use Efficiency</b>		<b><u>Page No</u></b>
2.0	Data Sources	71
2.1	Pattern of Trade	72
2.2	Court Records	73
2.3	Case History:	78
	2.3.1 Alteration in Point of Intake	78
	2.3.2 Application for Protection	79
	2.3.3 Application for Forfeiture	80
	2.3.4 Application to Change Purpose	82
	2.3.5 Petition to Parliament	83
2.4	Present Water Use Efficiency	84

## 2.0 Sources of Data

Data, taken from the Warden's Court journals at Blacks,<sup>1</sup> is used to examine modes of transfer and the likelihood of third party impairment. There were, at the height of mining activity, fifteen Warden Courts in Central Otago. Blacks is one of six key Courts.<sup>2</sup> Case history which is representative of the kind of litigation which was common is examined.<sup>3</sup> The case history is supplemented by information drawn from Ministry of Works files and National Archive records.

The data covers the period between 1866 and 1926. This was the only period for which extensive data is available. However, because of the economic transformations which occurred over this interval, the data provides us with fertile ground to test the hypothesis that water transfers separate from land would be likely to cause third party impairment. The period saw the development of mining prior to the turn of the century and then the transfer of water to farmers. The transfer of water between different user groups with differing return flow co-efficients provides us with an excellent opportunity to examine possible third party impairment.

---

1 The Court journals include the Warden's Registrar of Applications and the Plaints Book for the years 1866 to 1926. These are held at the Hocken library in Dunedin.

2 per com. T J Hearn and L W Hinchey.

3 The case history was selected for me by T J Hearn. He has completed a Phd in Geography which analyses resource use policy and conflict in Central Otago, between 1861 and 1921. The cases are held at the Hocken library along with Warden's Court Records. However, particular cases would be almost impossible to find as they have not been catalogued. Terry Hearn and myself have copies of all the relevant cases.

## 2.1 Pattern of Water Right Transfers

As is evident from the many transactions recorded on water right licences, it has been common to sell rights or subdivide rights in conjunction with the transfer of land. Such sales are recorded as assignments on water right certificates. Mortgages of the water rights to finance companies are also listed. In one of the certificates, reproduced in Appendix four, shares in the water right as low as 1/84 are recorded.

Although it has been common to sell water rights in conjunction with land, it has not been common to transfer rights separate from land.<sup>4</sup> One of the reasons for this is that in Central Otago Water rights are often worth far more than the associated land. Gillies (1975), in a submission concerning the proposed phasing out of mining privileges, argued that the chattel status of the water rights allowed them to:

"be traded towards the land from which they would give the best return, or more probably since the land was practically valueless without water, allowed the potentially better land to be traded towards the higher priority licences."<sup>5</sup>

It was often economic to buy better land and then construct races to transport water to the new property. Alterations and extensions of races are common on water race certificates.<sup>6</sup>

---

4 per com. Brian Mooney. Mr Mooney has audited the records of water rights issued as mining privileges. In his present job he oversees all matters arising from mining privilege water rights in Central Otago. The copy of water right certificate in Appendix Two was reproduced by Mr Mooney. The records were audited between 1969 and 1971 in response to the 1967 Water and Soil Conservation Act.

5 Gillies A. J. Former Chief Engineer Otago Catchment Board. Paper titled Mining Privileges. Held at Otago Catchment Board. P.2.

6 per com. Brian Mooney.

Alternatively a water right holder could purchase better land elsewhere in the catchment. The water could then be transported to the land via a change in the point of intake. The water right holder could also sell the licence to another land owner in the catchment, conditional on a change in the point of intake being granted. However the transfer of water separate from land was uncommon. As is evident from court records and case history attempts to alter the point of intake were commonly objected too.

## 2.2 Court Records

Data from the Blacks Warden's Court between 1866 and 1921, grouped in five year intervals, are listed in table one. The dashes represent periods for which data was not available. The first two rows record the number of applications for alterations in points of intake and changes in purpose, from mining to irrigation. The number of applications objected to is also recorded for each interval. The next two rows contain the number of applications for protection and suits of forfeiture or cancellation. Suits for forfeiture or cancellation are recorded jointly as these both achieved the same purpose. The Warden often recorded these suits as suits for forfeiture and cancellation.

Table One

DATA FROM THE WARDENS COURT AT BLACKS											
	1866	1871	1876	1881	1886	1891	1896	1901	1966	1911	1916
	—	—	—	—	—	—	—	—			
	1871	1876	1881	1886	1891	1896	1901	1906	1911	1916	1921
Alteration Point of Intake	3	10	5	—	8	11	25	3	10	2	12
Number Objected too	3	3	2	—	5	7	17	2	4	1	8
Change of Purpose								20	1	4	35
Objections								0	1	3	24
Forfeiture/ Cancellation	9	22	2	12	24	30	12	9	5	3	3
Protection	1	6	16	—	—	3	3	13	4	7	16

In total there are 131 forfeitures or cancellations recorded between 1866 and 1921. There are two marked high points in the number of forfeitures over the period. The first appears for the 5-year period prior to 1876 in which there is a total of 22 forfeitures. This is well over double the number of forfeitures for the previous 5-year period. In the 5 years following 1876 the number dramatically declines to 2. A similar fluctuation is found in the last decade of the 19th century where forfeitures peak at 30 before declining to 12 over the next five year interval.

The fluctuations in the number of forfeitures can be explained by reference to the degree of water scarcity and changes in statutory provisions. By 1871 most of the "available" water had been allocated.<sup>7</sup> This could explain the first large increase

7 Hearn T J Land, Water and Gold in Central Otago 1861-1921. Some aspects of resource use Policy and Conflict. Phd Geography, Otago University 1981. Chapter 4. P297. The reason the allocatable supply of water is referred to by the qualifier 'available', is that Central Otago as considerable supplies of water which are inaccessible. The Clutha River, and its major tributary the Kawarau River, have established entrenched courses making them relatively inaccessible as a source of water.

in forfeitures. The dramatic decline was probably in response to the provision in the 1877 Mines Act which allowed for a fine in lieu of forfeiture.<sup>8</sup> Until the grounds for a fine in lieu of forfeiture were formulated, by case history, individuals would have been unwilling to file expensive suits. The second peak, prior to the turn of the century, corresponds to a greatly increased demand for water. Large lease hold lands were subdivided and the mining industry went through an enormous expansion.<sup>9</sup> The subsequent rapid decline in forfeitures was probably a response to statutory provisions in 1898. These extended the grounds for protection and provided for a fine in lieu of forfeiture where "special circumstances" existed.<sup>10</sup>

Protection was a pre-emptive defence against forfeiture. The Warden did not always state whether protection pertained to mining claims or water races. Only applications where the Warden stated they referred to water races were counted. Thus the number is likely to be an underestimation. However, the figures indicate individuals responded to the increased threat of forfeiture by taking out protection. This is particularly evident in the five-year interval following the provisions to extend the grounds for protection put in place in 1898.<sup>11</sup>

---

8 See S.86 Mines Act 1877

9 Between 1878 and 1885 leasehold land totalling 6,944,126 acres, in Southland and Otago, became due to expire. For a detailed description of the breakup of large leasehold over the 1880s and 1890s see Hearn Chapter II. *supra* note 7. See Parcell J. C. Heart of the Desert Whitcoulls Publishers (1976) Chapter 14, for a discussion on boom of mining industry in the 1890s.

10 The Wardens Court interpreted the special circumstances listed in S.157 of The Mining Act 1898 as extending to a shortage of capital or labour. See *Ewing Vs The Scandinavian Water Race Company* 24.NZLR. 271.

11 Mining Act 1898 s.130-35.

An alternative means to forfeiture of transferring water, separate to land, was via a market purchase. However, rights could only be transferred in this manner if permission was granted to alter the point of intake. The alterations listed in figure one refer only to applications which sought to divert water into another race, in a different location along the stream. Simple alterations in the points of intake were excluded. These could have referred to shifts in intake as a result of floods washing out the head of a race. Because private transactions are not recorded in the Wardens' journals the figures cannot be used to indicate the extent of market transfers. Some of the alterations could have been applications by companies or individuals to reallocate water among their own races.

There are nearly 90 such alterations recorded. The number of alterations was not available over one 5-year interval. It appears forfeiture was a slightly more common way of transferring water. Again data peaks prior to the turn of the century corresponding to the increased demand for water. This period saw the amalgamation of many smaller mining companies into larger companies.<sup>12</sup> Thus, it is possible many of these alterations in the point of intake reflect market exchanges.

Also the peak in alterations corresponds to the sharp downturn in forfeitures between 1896 and 1901. As mentioned this period saw provisions for protection and a fine in lieu of forfeiture extended. Thus, the rise in the number of potential market exchanges appears to be in response to restrictions imposed on the opportunity to file successful suits of forfeiture. Indeed, in the 25 years following 1896 there were 52 changes in the point of intake in comparison to 32 forfeitures, whereas, in the 30 years prior to 1896 forfeitures exceeded alterations by 62. When restrictions were imposed on forfeiture individuals responded by more frequently using market exchanges to transfer water separate from land.

---

<sup>12</sup> Hearn, *supra* note 9.



On average 70 percent of applications to transfer water via points of intake were objected to. This indicates transfers were likely to cause third party impairment. It was not possible to examine the individual case history of each application. Thus the exact extent of the affect objections had on transferability cannot be ascertained. However, in that objections were fairly persistent the Courts must have satisfied many of the objector's claims. Third party impairment was an obstacle to the market transfer of water separable from land.

From 1903 onwards it was possible to apply for a change of purpose from mining to irrigation. In the two years following 1903 there were 20 such applications none of which were objected too. The number then dramatically drops to 5 applications over the next decade and then climbs to a peak of 35 between the years 1916 to 1920. In contrast to the earlier applications the majority of later applications are objected to. The disparity in the number of objections between the later and earlier periods can be explained by reference to the nature of the applications. The majority of the earlier applications were placed by individuals, along small streams or tributaries, while the later applications pertained to large water rights held by companies.<sup>13</sup> The affect on third parties, via changes in consumption diversion ratios, would be greater where changes in use involved large volumes of water. Also where rights were situated along small tributaries the affect of such changes would not necessarily, be easily perceived by right holders on the main river stream. In fact many small rights, along tributaries, were used illegally for irrigation purposes without ever being challenged.<sup>14</sup>

---

13 per com. Terry Hearn. This was also evident as I surveyed the Court records. In some of the latter applications companies attempted to change six or seven rights to irrigation in one application.

14 This evident from Ministry of Works and Development communications regarding water rights. See Reports on Private Applications for Water Rights Summary of MOWD Alexandra File No. 33. Summarised at District Office 1981.

## 2.3 Case History

### 2.3.1 Alteration in the Point of Intake

On 12 February 1897 an application was lodged in the Wardens Court at Clyde by a miner named John Magnus. He wished to shift his point of intake about half a mile down stream. He argued the alteration was desirable as snow lay for a shorter period downstream and this would allow him to utilise water earlier in summer. The application was objected to by farmers who held water rights further down the catchment.

The objectors argued that their rights were seldom if ever fully supplied in summer. That there was, "... little water ever available at the present head of the applicants race but there would be much more at the proposed new point." They argued this would occur because several tributaries joined the creek between the then present head and the proposed head. If the alteration was granted they felt their rights would be "seriously prejudiced".

The Warden ruled against the proposed shift in the point of intake. He thought it was a "...deliberate plan whereby, under the wing of the Warden and the Warden's Court, the applicants may get the benefit of water, the right of use of which is vested in others ..." If property rights to water had also been defined in terms of historical consumptive use this dispute could have been avoided. The Warden could have granted the right to shift the point of intake conditional on an appropriate reduction in the quantity diverted.

The case illustrates another issue raised by poorly defined property rights. Individuals are provided with an incentive to cause third party impairment where

property rights to water are delineated solely on the basis of diversion. John Magnus probably knew the shift in the point of his intake would gain him access to additional water. If Magnus could have managed to persuade the Warden of his case he could have obtained water at a premium price.

### 2.3.2 Application for Protection

In 1912 John Ewing, a hydraulic mining engineer, applied for protection for two water race rights. Ewing held prior rights which consumed most of the summer time flow in the Dunstan Creek. He applied on the grounds that he required time in which to survey a course for a race extension, and negotiate with farmers, through whose properties the race would pass. The extension to the race meant the water would have been exported out of the watershed. Ewing who had previously sold his water to miners intended to sell the water to farmers.

Three mining companies objected to Ewing's application for protection. They argued that a grant for protection was not necessary to enable Ewing to carry out the actions cited as grounds for protection. And that in any case "... the water was required for mining purposes in the vicinity" the Warden ruled against the application for protection.

However the Warden, in his judgment, does not refer to the objector's claims but to the needs of farmers in the valley. He argues the export of water to sell it to farmers in another valley was not equitable. He states that since "...the whole country..." was "sheep carrying the water should be retained in the valley to which it belongs. That the grant of water "to few people at the expense to others" as occurred in the Goldfields led to "...large areas being turned into wastes, or at least, giving some areas a great advantage over others". His statement reflects a general

sentiment in the community. It was commonly felt, especially among farmers, that the mining privilege system led to an inequitable distribution of water.<sup>15</sup>

The case illustrates the obstacles to investment opportunities generated by poorly defined property rights. In applying for protection Ewing had a hidden agenda. As is evident from objections to changes in purpose Ewing would have encountered major obstacles when he applied to use the right for irrigation. If the Warden had granted Ewing protection, on the grounds stipulated in his application, the Warden would have sanctioned a change in purpose. In fact the Warden commented that if he had granted protection it "...could not fail to be regarded as in some measure a sanction to the intention of the change in purpose, and must embarrass the Warden who would have to deal with the matter." In applying for protection Ewing was attempting to lower transaction costs by avoiding extensive litigation over a change in purpose.

### 2.3.3 Application for Forfeiture

In October 1919 a suit for forfeiture of water rights held by Josiah Lane, a Dunedin cordial manufacturer, was filed in the Wardens Court at Alexandra. Lane had formally used the rights for mining and when the gold was exhausted he had neglected to apply for a change of purpose to irrigation. He had attempted to sell the rights to the Crown. He now intended selling the rights to the Vincent County Council, provided he was successful in securing a change of purpose. In order to protect his rights from forfeiture he employed a caretaker on the pretence that the rights were being utilised.<sup>16</sup>

---

15 Hearn Chapter 4 *supra* note 7.

16 See Memo P W 334 PWD Alex to PWD Dunedin. 14 May 1918 MOWD files *supra* note 13.

The plaintiffs were a farmer and a fruit grower who held lower priority rights. They claimed Lane's water rights had not been used for their proper purpose for two years. They also managed to get Lane's former dredgemaster to testify. He said Lane had given him instructions to operate the dredge, in order to protect the water rights. The Warden ruled in favour of forfeiture.

However the matter did not stop here. The Vincent City Council had entered into a contract with Lane to purchase his rights conditional on a change of purpose being granted. The water was being used for domestic purposes by over 100 settlers. It was not mandatory to hold rights to water where it was used for domestic purposes; no right conferred priority over domestic use. Since the settlers' rights were ill-defined, the forfeiture of Lane's rights would impose a third party effects on the settlers. In order to protect these domestic users the Vincent City Council petitioned parliament. The Vincent City Council managed to persuade parliament to extend the conditions under which a fine in lieu of forfeiture could be declared.<sup>17</sup> The Mining Amendment Act 1919 provided that a fine in lieu of forfeiture, 'could be declared where it was "unjust and inequitable" to decree forfeiture, or where it was in the "public interest".<sup>18</sup> Lane appealed on the grounds that the forfeiture was in the public's interest. However the Warden, with reference to the retrospective nature of the legislation, decided the rights should be forfeited.<sup>19</sup>

---

17 See Hansard 1919 Pg 1054 - 1057.

18 Mining Amendment Act 1919 s.5.

19 In his judgment the Warden dryly notes "... he (Lane) has agreed to sell the water rights in question to two individuals who have agreed to vest such rights in the Vincent County Council, evidently anticipating the amendment to the Mining Act, and with the object of satisfying me that the public would be benefited by my not decreeing forfeiture".

#### 2.3.4 Change of Purpose

It is evident from communications in Ministry of Works files that third party impairment could be produced by changes purpose. On 5 June 1919 ten people applied for a change of purpose from mining to irrigation, industrial and domestic. The ten were all located along tributaries of the Manukerikia river. The river supplied a government irrigation scheme. The Ministry proceeded to object to the proposed changes on the basis that, "If the water is spread on the land instead of returning to Manukerikia River by the present sludge channels, the flow available at the intake fo the Manuherikia water race will be reduced". The Ministry clearly feared that alterations in diversion consumption ratios created by the change in purpose would prejudice its water rights.<sup>20</sup>

However the Ministry withdrew its objections. On further investigation, it was realised the volumes of water involved were small and the water had been used illegally for several years for irrigation. It was considered this would be hard to stop. This case supports the argument advanced earlier that small rights located along tributaries were more likely to be granted changes of purpose without confronting objections. It also supports my conjecture that the data is an underestimation of the number of cases heard in the Blacks Court. Although the ten cases were heard at Blacks in 1919 between 1916 and 1921 I only found 4 in the register.

---

20 Application Nos 18 and 19, June–September 1919 MOWD files supra note 13.

### 2.3.5 Petition to Parliament

Probably the most striking evidence that transfers of water between different user groups caused third party impairment comes from a petition to parliament. In 1919 the Mines and Goalfields committee was petitioned by a group of 22 farmers from Central Otago. The farmers were concerned by a proposed amendment to the Mining Act.

The amendment would have allowed the State to acquire rights which were abandoned or forfeited. The farmers held water rights dependent on the return flows from a prior mining right. The mining company which owned the right had successfully applied for protection and wished to sell its rights. The farmers were concerned that if the right was eventually abandoned the State would take them over and use them for irrigation purposes.

If the rights were used for irrigation purposes return flow coefficients would have been altered at great cost to the farmers. In a hearing, before the 1919 Mines Committee, farmer representatives made it abundantly clear that they had invested large sums in the construction of races. In their petition, referring to how the change of purpose would alter return flows, the farmers state:

"...You, sir, know the difference between rights held for mining and those held for irrigation, and it is unnecessary to prove to you that we obtain more water when prior rights are mining than we should if they were held for irrigation because of drainage, leakage, etc."

The farmers also had another issue on their agenda. They wanted to amend the problems caused by changes in purpose by amending the legislation. They requested

that where rights were changed from mining to irrigation such licences should lose priority over existing irrigation rights. The self interest motivating this proposal is strikingly obvious. The farmers petition and the minutes of their submission to the mines committee are reproduced in Appendix Three.

#### 2.4 Present Water Use Efficiency

There are at least five different ways to define irrigation efficiencies.<sup>21</sup> The measure used here is defined as the ratio of water in the plant root zone to total water supplied at the farm gate. The relative efficiencies of 5 different irrigation techniques used in Central Otago are listed in Table two. Alongside these figures the percentage of land area they irrigate is recorded. The overall efficiency of irrigation in Central Otago is listed as 40 percent. This compares unfavourably with a potential efficiency of 75 percent achieved by the use of spray irrigation.<sup>22</sup>

Figure Two

CENTRAL OTAGO IRRIGATION		
Application Method	% Water Use Efficiency*	% Otago Irrigated Area
Spray	60-75	10
Border-Dyke	60-70	10
Corrugation	50-60	)
Contouring	40-60	) 80
Wild Flooding	10-50	)
Overall	probably less than 40	100

\* Efficiency here is defined as ratio of water retained in the plant root zone to total water supplied at farm gate.

Above figures from Carstens 'Irrigation in Central Otago', 1984  
All are rough order only. Internal Report MWD R84/19

21 See Painter D and Carran P What is irrigation efficiency Soil and Water Oct1978.

22 Carstens (1984) Irrigation in Central Otago MWD Internal Report.



However what appears to be an efficient use of water may not be economically viable. Whether or not a particular irrigation technique is economical depends on a range of factors. These include the soil type, crop grown prices and reliability of water supply.<sup>23</sup> However, it is clear from surveys on water use in Central Otago, there are "numerous opportunities ... for efficient and economic sprinkler irrigation systems..."<sup>24</sup>

The reasons behind the low efficiency are at least two fold. First government subsidisation of community irrigation schemes has meant historically low prices for water. This has provided farmers with a disincentive to invest in irrigation equipment which would use the water more efficiently.<sup>25</sup> Prices are currently being re-adjusted to ensure more realistic charges for water. This will provide an incentive for farmers to use water more efficiently. In fact, on my field trip to Central Otago, I talked to a farmer whose son had invested in spray equipment in response to the increased price charged for water.

The second reason behind the inefficiencies is that risk is shared unequally among private water right holders. This was evident from interviews with farmers, Catchment board staff and Ministry of Works personal. One of the indicators of this is that in general only farmers who hold high priority rights, or are on community irrigation schemes, can risk investing in spray irrigation equipment. The nature of their rights guarantees them a supply of water during the summer months. Without an assured water supply investment in irrigation equipment is too risky. Without a summer water supply it would lie idle.

---

23 Ibid p.7.

24 Engelbrecht, Rayds, Tavendale and Co. Limited Farm Management Consultants Ashburton. Survey Report on Irrigation Charges, Water Quotas and Scheme Management in the Older Central Otago Irrigation Schemes p.27.

25 Supra note 21 p.7.

In many cases where farmers use spray irrigation, they allocate only a fraction of their water supply to this method of irrigation. This is because of the diseconomies of scale involved in using spray irrigation equipment. Labour time and costs involved in shifting irrigation equipment eventually became prohibitive.<sup>26</sup> Clearly if water were redistributed, to increase the opportunities available to use spray irrigation, total farm revenue could be increased.

There is also preliminary evidence that where farmers use identical irrigation techniques, lower priority appropriators use water more efficiently than higher priority appropriators. To use water efficiently in Central Otago farmers need to apply water as early as possible. Early irrigation maintains maximum pasture growth and avoids costly soil moisture deficits.<sup>27</sup> It was claimed, by a high priority right holder who had invested extensively in spray irrigation equipment, that in many cases senior appropriators applied water later than junior appropriators.

---

26 per com. L W Hinchey (former farmer and Catchment Board member) and G Herlihy (farmer at Pataroa. MSC. Agricultural Science).

27 Engelbrecht rates" it is more economic when predicting forward, to have irrigated when it was not required because of subsequent rainfall, than to have irrigated when subsequent weather conditions determined that it was necessary". Supra note 23 p.25.

His suggestion was indirectly supported by comments from farmers, Catchment Board staff and Ministry of Works staff. It was widely accepted that a "smart farmer", who held a low priority right, could harvest a spring crop by irrigating "earlier in the season than most farmers". In fact the Catchment board still issues boards rights, which have no priority, to farmers who want to take advantage of high spring flows.

**APPENDIX THREE**

<b>Petition to Parliament and Minutes of Gold Fields and Mines Committee 1919</b>		<b><u>Page No</u></b>
3.0	Petition to 1919 Goldfields and Mines Committee	89
3.1	Transcript Committee Minutes	92

GOLDFIELDS AND MINES COMMITTEE

Mr Scott – Chairman

Wednesday, 15th October, 1919

MINING BILL

John Wilson, Farmer, Lauder, examined

The Chairman : I will ask the clerk to read a petition to myself as member for Otago Central in connection with the Bill.

The Petition was read by the Clerk as follows:

COPY ONLY

National Archives File LE/1/1919/4

To Robert Scott, Esq., M.P.

Sir, we the undersigned irrigation right-holders in the Omapu, Lauder, and Matakau districts earnestly desire you to protect our interests in the matter of clauses contained in the Mining Act Amendment Bill now or shortly to be considered by the House.

The clauses which we consider to be unjust and detrimental to our interests are clauses 2 and 4, which provide for acquisition by the Crown of abandoned rights with all priority and rights whose time has expired. In most cases our rights are inferior rights and depend to a large extent on water from rights which have been practically abandoned.

We would point out to you that from Chatto Creek, Thompson's Gorge, and Lauder Gorge there are 77 heads of first rights, half of which are paper rights held by a syndicate in protection, looking forward to the time when clauses 3 and 4 will come into operation. It is quite unnecessary to point out to you their object.

Further, our rights have been developed by miles of races to our properties at a large cost and the productiveness of our land will be seriously impaired should our races not be able to obtain their full right.

We think it unjust that, having purchased these rights, many of which are of long standing, on the understanding that they were subsidiary only to mining rights the Crown should step in and acquire the rights referred to, our loss. You, sir, know the difference between rights held for mining and those held for irrigation, and it is unnecessary to prove to you that we obtain more water when prior rights are mining than we should be they were held for irrigation because of drainage, leakage, etc.

We may say also that as more rights have been granted than the sources can supply in summer we do not even now obtain all the water for which we hold rights.

We respectfully ask that you use every endeavour to have these clauses struck out or amended so that all rights acquired by the Crown or changed from mining to irrigation should not have priority to existing irrigation rights as it is obviously unjust to transfer a large first right originally granted for mining to an irrigation right with same priority.

We are, Sir,  
Yours Respectfully,

John Wilson, farmer, Lauder  
Sarah McGuckin, farmer, Omakau  
Geo T Alexander, for J Alexander, farmer, Lauder

H A Simes, farmer, Lauder  
Frank Donnelly, sheep farmer, Lauder  
A M Minehan, farmer, Drybread  
John Leancy, farmer, Omakau/farmer, Drybread  
O' Gordon Glassford, for L Gordon, Glassford  
Kellett and Muirhead, orchardists, Drybread  
R Brown, farmer, Lauder  
John Leask, farmer, Lauder  
James Clouston, farmer, Lauder  
Janet Clouston, farmer, Lauder  
T F Moran, farmer, Lauder  
D Moran, farmer, Lauder  
John R Clare, farmer, Omakau (representing Lauder Domain)

Lena Stafford, farmer, Omakau  
Robert Mee, farmer, Becks  
R S B Clarke, wool scourer, Omakau  
J Arnold, farmer, Omakau  
Patrick O' Dea, R. C. priest.

The Chairman : Have you any statement to make, Mr Wilson, in addition to what is contained in the petition? – The petition pretty well represents the position, and I have come to answer any questions the Committee may wish to put to me.

What is the extent of your water-races that you use for irrigation? – About 30 miles.

Some of it, I suppose, is also used for stock? – Yes, and for domestic purposes.

You think that if clause 2 passes it may put some of your rights in jeopardy? – Yes

Will you explain why you think they won't be safe? – There are many old rights on paper that are not legitimately used, and we are using them for irrigation, and if the Government take them over and exercise the prior right we would have no water at all.

Mr Poland: Are they on paper only? – No one interfered with the miners as long as they were using the rights, but we understand now that the mining companies concerned are not paying and wish the Government to take them over.

The Hon Sir W Fraser – Do you mean, the Government to purchase them? – Yes.

The Chairman: How many heads of water have you rights for? – For ten heads, at Lauder Gorge.

Have you water from any other source? – Yes, but only tail water rights.

You use the water the miners have used? Yes. My rights are inferior to the miners'.

How long have you been using the water for irrigation?— About thirty years.

You were the first settler to irrigate? – Yes. I put in the first race.

There are other settlers in the district besides yourself interested in the matter? – Yes ; there are 23 in the petition. Others were not at home when the signatures were being taken.



They all take the same view as yourself? – Yes

They are afraid this proposal will put them in a bad position if the old races are taken up? – Yes. It will ruin our work. We were satisfied while the mining was going on to use their surplus water and tail water, and now if the mining is given up our works will be useless unless we get protection. We do not want priority as long as they are using it for mining.

Have you a change of purpose for all the water you use? – Yes, from mining to irrigation.

The Hon Sir W Fraser: In the petition there is a remark that a certain syndicate holds water rights and that they are the active agents in promoting this clause. What ground have you for saying that? – All the waters on the Matakanui and Drybread, diggings which were controlled by a large mining population in the early days have been transferred and are now in the hands of one company.

Which company is it? – The Tinkers Company. They control all the mining rights on the old goldfields.

And in the event of cancellation of forfeiture because they do not use their rights for mining purposes, would not those rights cease? – They won't allow them to be cancelled. They would make a sale of it.

Who would buy from them? – I understand there are people looking for them.

Are you aware that according to the existing law nobody can get a transfer from a mining right to an irrigation right without the consent of the Minister of Mines ? – Yes, that is correct.

And if the mining operations cease and the company could not use the water for mining, there is no more value in their race because the Crown won't give them the right to transfer. – There was one right transferred from mining to irrigation last court day.

A warden cannot grant the transfer without the consent of the Crown. Do you know that is the law? – Yes.

How then could this syndicate expect to sell its rights? – A company went into liquidation recently, and the liquidator sold its shares to people for irrigation, and the matter was granted in the Warden's Court.

How could he do that? – An application was made for change of purpose, and there was no objection, and it was granted.

You will find that the Warden has not the power without the consent of the Minister. – I am telling you what happened.

The object of our legislation is to prevent men who have held rights for a long time for a particular purpose from selling them as valuable rights for another purpose. The Crown did this for the protection of the settlers and to prevent monopoly. – I understand that, but I am telling you what happened.

In this case the application would be granted subject to the consent of the Minister. I do not know whether that was inserted or not. I suppose if there was no objection the Minister could grant it if the Warden recommended favourably.

It does not follow. – We get very shaky over using the water that we have been using for many years for irrigation for the development of the country. I am not fighting against the miner, but when the mining is absolutely done and the water has to be used for another purpose I say that the people who have used it for so long should have priority. I would not like to see the purpose of the water changed and the people who have been using it lose priority in irrigation.

You say you have ten heads of water? – Yes, out of the Lauder Gorge.

Is that a prior right for irrigation? – No, it is an inferior right to mining but first right in irrigation.

You cannot mine with the water? – No, and we think that if the Government take over the rights from the company we may lose by it.

What do you suppose the Government might take them over for? – They might take them over under an irrigation scheme.

To supply the people with water? – Yes

And if the Government takes them over it is in the interests of the public? – Yes, but we want the existing irrigation rights protected. Our rights are especially valuable in the summer, when there is not much water available.

How much water is there in the summer? – I have seen it down to ten or twelve heads in the creek, and in my race that has ten heads I have seen two or three heads.

As long as the miners use the water you have not the right to ten heads or water, have you? – I understand the miners have the first right. They were first in the field. My argument however is that when the gold is not paying the water should revert to irrigation and those who have been using it for that purpose should have a prior right.

I may say that the object of the proposed law is this: The Crown desires to hold the water when a change of purpose is necessary in order to see that no one person shall monopolise it.

We say that the water should be let out for irrigation purposes to all and sundry to work their land and that it should not fall into the hands of monopolies. –I thank you for the information.

Mr Lee: At present you hold rights for irrigation purposes? – Yes

And there are prior rights for mining purposes? – Yes

If the water is not used for mining purposes and the preceeding certificates are cancelled you will obtain what you do not get now – your full quantity of water for irrigation purposes? – I am more likely to get it.

If the Crown steps in and takes up the rights now granted for mining purposes and distributes the water for irrigation purposes it will use the whole quantity and deplete your supply? – Yes, it would leave us with no water and we would lose our existing rights.

Mr T W Rhodes: You say that these rights are only paper rights. If you had brought an action for forfeiture would not your right have become paramount? – Yes.

It seems peculiar you did not do that? – The company has its rights protected.

No objection has been lodged? – No. As long as they are used for mining we get the water.

Your fear is that the Crown will come in and take up what you regard as your right?  
– Yes. The whole thing is if the purpose of the rights is changed from mining to irrigation through the mines not paying, the existing irrigation right should be protected and have priority on account of having used the water for many years for irrigation.

## APPENDIX FOUR

<b>Water Allocation Plans: Prior Appropriation Vs Equal Sharing</b>	<u>Page No</u>
4.1 Opihi River Resource Allocation (Example of water sharing plan)	98
4.2 Examples of conditions attached to licences by boards	99
4.3 Example of Mining Privilege Water Race Right	101
4.4 Example of Conditions attached to Mining Privilege Water Rights	106
4.5 Priority Listing for Lindis River	107

## OPIHI RIVER WATER RESOURCE

## ALLOCATIONS

(in m<sup>3</sup>/s)

Total Flow	Rural Water Supply Schemes	T.C.C. Municipal Supply	Flow at Saleyards br *2	Instream Uses	Irrigation	
					L.P.I.S.	Private
1.5	0.36	0.14	1.0	1.0	0	0
2.0			1.5	1.5	0	0
2.5			2.0	2.0	0	0 *6
2.6			2.1	1.6	0.5	0
2.8			2.3	1.8	0.5	0 *5
2.9			2.4	1.6	0.5	0.3
3.5			3.0	2.2	0.5	0.3 *4
3.6			3.1	1.37	1.13	0.6
4.0			3.5	1.77	1.13	0.6
4.5			4.0	2.27	1.13	0.6
5.0			4.5	2.77	1.13	0.6
5.5			5.0	3.27	1.13	0.6 *3
5.6			5.1	2.12	1.98	1.0
6.0			5.5	2.52	1.98	1.0
6.5			6.0	3.02	1.98	1.0
7.0			6.5	3.52	1.98	1.0
7.5			7.0	4.02	1.98	1.0
7.6			7.1	3.04	3.06	1.0
8.0			7.5	3.44	3.06	1.0
8.5			8.0	3.94	3.06	1.0
9.0			8.5	4.44	3.06	1.0
9.5			9.0	4.94	3.06	1.0
10.0			9.5	5.44	3.06	1.0
10.5	0.36	0.14	10.0 *1	5.94	3.06	1.0

**Notes:**

- \*1 Above 10m<sup>3</sup>/s diversion to out-of-river storages would be permitted, but controlled by conditions to the water right.
- \*2 Public water supplies (municipal and stockwater) are in general abstracted upstream of the Board's recorder stations at Cave, Rockwood and Skipton
- \*3 'S' rights are suspended at 5.0m<sup>3</sup>/s.
- \*4 'A' rights are halved at 3.0m<sup>3</sup>/s.
- \*5 All private water rights are suspended at 2.3m<sup>3</sup>/s.
- \*6 All irrigation abstractions suspended at 2.0m<sup>3</sup>/s.

(from Scarf *et al.*, 1984)

# EXAMPLES OF WATER RIGHTS

No. NCY 860282

## NORTH CANTERBURY CATCHMENT BOARD & REGIONAL WATER BOARD

### RIGHT IN RESPECT OF NATURAL WATER

(pursuant to Section 21(3) of the Water and  
Soil Conservation Act 1967)

THE NORTH CANTERBURY CATCHMENT BOARD, the Regional Water Board for the North  
Canterbury Water Region, HEREBY GRANTS TO

NAME	HAMISH J. ANDERSON
ADDRESS	Rotherham, R.D.

#### THE RIGHT TO

take up to 1300 cubic metres of water per day at a maximum rate of 30  
litres per second for 12 hours per day from a spring-fed tributary of Waiau  
River (locally known as Slaughterhouse Stream) at map reference S054:323613  
for spray irrigation of crops and pasture

#### IN CONNECTION WITH THE FOLLOWING PROPERTY

LOCATION	S.H. 70 near Greens Road, Rotherham
LEGAL DESCRIPTION	pt Lot 9 D.P. 2696 & Lot 1 D.P. 26139 Block XVI, Lyndon Survey District

#### TERM OF RIGHT

COMMENCEMENT	1 September 1986	EXPIRY	30 April 1990
--------------	------------------	--------	---------------

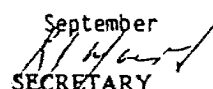
#### CONDITIONS TO WHICH RIGHT IS SUBJECT

- (1) The grantee shall operate and maintain a suitable fish screen on the pump suction intake to the satisfaction of the Regional Water Board.
- (2) The grantee shall restrict or suspend the taking of water by direction of the Regional Water Board in accordance with the approved water allocation plan in the Waiau River.

Note: The Water Allocation Plan minimum flows for the Waiau River at  
Marble Point are (in cubic metres per second):

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
20	15	15	20	25	25	25	25	25	25	25	25

Issued at Christchurch this 16th day of September 19 86

  
SECRETARY

## NORTH CANTERBURY CATCHMENT BOARD &amp; REGIONAL WATER BOARD

## RIGHT IN RESPECT OF NATURAL WATER

(pursuant to Section 21(3) of the Water and  
Soil Conservation Act 1967)

THE NORTH CANTERBURY CATCHMENT BOARD, the Regional Water Board for the North  
Canterbury Water Region, HEREBY GRANTS TO

NAME	PETER LECLERC SQUIRES
ADDRESS	Brookside, Leeston R.D.

## THE RIGHT TO

take up to 1000 cubic metres of water per day at a maximum rate of 15 litres per second from Boggy Creek at map reference S083:673354 for spray irrigation purposes

## IN CONNECTION WITH THE FOLLOWING PROPERTY

LOCATION	Brookside
LEGAL DESCRIPTION	R.S. 10792 Block IX, Leeston Survey District

## TERM OF RIGHT

COMMENCEMENT	1 October 1985	EXPIRY	30 April 1989
--------------	----------------	--------	---------------

## CONDITIONS TO WHICH RIGHT IS SUBJECT

- (a) the grantee shall operate and maintain a suitable fish screen on the pump suction intake to the satisfaction of the Regional Water Board.
- (b) that at Irwell-Rakaia Road the following minimum flow conditions are established:
- (i) At flows greater than 150 litres per second - no restrictions on abstraction
  - (ii) At flows greater than 60 litres per second and less than 150 litres per second the following roster to apply.  
P.L. Squires to abstract from and including Sunday, to and including Wednesday of each week, and D.H. Green from and including Thursday, to and including Saturday of each week.
  - (iii) At flows of 60 litres per second and less in Boggy Creek measured at Irwell-Rakaia Rd abstraction by all water right holders above Caldwell's Road to cease.

Issued at Christchurch this 15th

day of October

1985

*[Signature]*  
SECRETARY



Assignment  $2\frac{7}{8}$   
John Ewart Webb  
to  
John Patrick Webb

as received at the office of the Otago Regional  
Water Board, Dunedin, on 1 September 1981

and recorded as No. 564 W.

Brian R Mooney  
PP Secretary

Assignment of  $\frac{3}{12}$   
Clifford Keith George  
to  
Clifford Keith George  $\frac{1}{2}$   
and  
David Keith George  $\frac{1}{3}$   
and

Gary Richard George }  
and  
Lynne Katherine George }  $\frac{1}{6}$

as received at the office of the Otago Regional  
Water Board, Dunedin, on 1 September 1981

and recorded as No. 566 W.

Brian R Mooney  
PP Secretary

Assignment of  $\frac{1}{42}$   
Thelma Florence Stephens  
to  
James Gysbertus Arnobius Belt

as received at the office of the Otago Regional  
Water Board, Dunedin, on 12 May 1982

and recorded as No. 607 W.

Brian R Mooney  
PP Secretary

1097 G

D.141  
G. 145,285,444  
K. 230

No. 1097

DATED 4<sup>th</sup> September 1902

UNDER THE MINING ACT 1898  
1926

### WARDEN

TO  
David Murley, Charlotte Penman,  
Ah Kew and The Mayor, Councillors  
and Burgesses of the Borough  
of Cromwell

### Licence for a Water Race

The file copy of this licence being  
in a state of disrepair, this  
copy was prepared from the  
Licence Registers and documents  
at the office of the Otago  
Catchment Board, Dunedin.

Duplicate prepared by the Otago Regional  
Water Board, Dunedin, on 7<sup>th</sup> December 1973

and recorded as No. 1097 G

Brian R Mooney  
PP Secretary

Assignment  
William James Stephens  
to

Thelma Florence Stephens

Notice received at the office of the Otago Regional

Water Board, Dunedin, on 2<sup>nd</sup> September 1976

and recorded as No. 234 W.

Brian R Mooney  
PP Secretary

Assignment of Easement  
under Certificate No 3913

Harry Joseph Webb

and  
John Ewart Webb

to  
John Patrick Webb

Notice received at the office of the Otago Regional

Water Board, Dunedin, on 17<sup>th</sup> October 1977

and recorded as No. 372 W.

Brian R Mooney  
PP Secretary

Endorsement

Right No 1607, to continue to use  
and maintain the race described  
in Licence No 4708 Cromwell Registry.  
(Endorsement pursuant to S.24(5)  
of the Water & Soil Conservation Amendment  
Act 1971)

Board

to  
Clifford Keith George  
Right granted by the Otago Regional

Water Board, Dunedin, on 21<sup>st</sup> November 1977

and recorded as No. 372-1

Brian R Mooney  
PP Secretary

Transmission  
Frank Peacock  
to  
Alfred Peacock

Notice received at the office of the Otago Regional

Water Board, Dunedin, on 26<sup>th</sup> April 1978

and recorded as No. 410 W.

Brian R Mooney  
PP Secretary

Assignment  
Alfred Peacock

to  
John Hector McGregor

Notice received at the office of the Otago Regional

Water Board, Dunedin, on 26<sup>th</sup> April 1978

and recorded as No. 411 W.

Brian R Mooney  
PP Secretary

Discharge Mortgages Nos 8112 G & 88881 G  
State Advances Corporation of NZ

to  
Clifford Keith George

Notice received at the office of the Otago Regional

Water Board, Dunedin, on 1 September 1981

and recorded as No. 565 W.

Brian R Mooney  
PP Secretary

Duplicate prepared by the Otago Regional  
Water Board, Dunedin, on 7<sup>th</sup> November 1973  
and recorded as No. 1097 Cr

Application No. 144/1902

Licence No. 1097

Robert B. Mooney  
PP Secretary

Under the Mining Act ~~1896~~ 1898

## LICENCE FOR A WATER RACE

PURSUANT to the Mining Act <sup>1898</sup> ~~1896~~, I the undersigned, \_\_\_\_\_  
Frederick James Burgess, a Warden of the  
Otago Mining District, do hereby grant to

(1) Full name,  
residence, and  
occupation.

(1) David Murley of Cromwell, Farmer; Charlotte Perriam of Lonsburn, Widow;  
Al Kent of Cromwell, Gardener; and The Mayor Councillor & Burgesses of the Borough  
this Licence for a water race, as specified in the First Schedule hereto. <sup>of Cromwell</sup>

This Licence is granted for a term of 42 years, commencing on  
the date hereof, subject to the terms, conditions, reservations, and provisions  
set out in the aforesaid Act, and the regulations thereunder, and also to such  
additional terms, conditions, reservations, and provisions as are specified in the  
Second Schedule hereto.

IN WITNESS WHEREOF I have hereunto subscribed my name, and  
affixed the seal of the Warden's Court at Cromwell,  
this fourth day of September 1902 ~~1901~~

## FIRST SCHEDULE

(1) Set out locality  
of race and nature  
of the proposed  
work as set forth  
in application,  
modified, however,  
so as to accord with  
the grant, adding  
such other  
particulars as are  
necessary, including  
plan of land, if  
surveyed, number  
of heads authorised  
to be diverted, and  
purpose for which  
water is to be used.

(2) Commencing at a point in Parkburn Creek  
taking thence 12 heads also lifting on its  
route from a point 2 miles below Parkburn  
Creek 1 head, from Stratford's Creek 3 heads  
and from Hatter's Gully 1 head and  
terminating at Cromwell.  
Water to be used for mining, irrigation,  
industrial and domestic purposes.

## SECOND SCHEDULE

(1) Set out additional terms etc., if any.

"This licence is issued in lieu of Water Race License N° 7829 issued under "The Mining Act 1891" and surrendered by the said David Murley; Charlotte Perriam; Ah Kew; and The Mayor Councillors and Burgesses of the Borough of Cramwell:  
Right to divert 17 Government heads of water with priority to such water to date from and including, for 12 heads from Parkburn Creek 10<sup>th</sup> March 1866, for 1 head from a point two miles below Parkburn Creek 11<sup>th</sup> September 1873, for 3 heads from Stratford's Creek 25<sup>th</sup> September 1867, for 1 head from Hatter's Gully 11<sup>th</sup> September 1873

(Signed) Fred. J. Burgess

Warden.

500/7/61-40921 W

Assignment  $\frac{1}{2}$  share: David Murley to Charles Cyril Sanders.  
Registered 1235.18.7.04 as N° 1575

Mortgage: Charles Cyril Sanders to David Murley.  
Registered 1235.18.7.04 as N° 1576

Mortgage: Charlotte Perriam to George Alexander Morris.  
Registered 1550.19.9.02 as N° 1616

Transmission: Ah Kew to Wong Tan and Ah Too.  
Registered 1100.4.2.08 as N° 1675

Assignment: Wong Tan and Ah Too to William Stephens.  
Registered 1125.25.2.05 as N° 1685

Discharge Mortgage N° 1576: David Murley to Charles Cyril Sanders.  
Registered 1519.20.4.06 as N° 1952

Mortgage: Charles Cyril Sanders to The Trustees of The Loyal Cromwell Lodge (N° 5850) Manchester Unity Independent Order of Oddfellows.  
Registered 1519.20.4.06 as N° 1953

Discharge Mortgage N° 1616: George Alexander Morris to Charlotte Perriam.  
Registered 1140.10.9.07 as N° 2258

Discharge Mortgage N° 1953: Trustees Cromwell Lodge (N° 5850) Manchester Unity Independent Order of Oddfellows to Charles Cyril Sanders.  
Registered 1220.7.10.07 as N° 2262

Mortgage: Charles Cyril Sanders to John Jameson.  
Registered 1220.7.10.07 as N° 2263

Transmission: Charlotte Perriam to William Colclough and John William Perriam.  
Registered 1245.11.2.08 as N° 2331

Assignment: William Colclough and John William Perriam to Michael Louis Spratt.  
Registered 1000.12.2.08 as N° 2332

Assignment: Charles Cyril Sanders and John Jameson (mortgagee) to George Scott. ( $\frac{1}{2}$  share).  
Registered 145.2.3.09 as N° 2604

Assignment  $\frac{1}{2}$  share: Charles Cyril Sanders to and John Jameson (mortgagee) to James Mackenzie.  
Registered 1145.2.3.09 as N° 2605

Mortgage: George Scott to John Jameson.  
Registered 1145.2.3.09 as N° 2606

Mortgage: James Mackenzie to John Jameson.  
Registered 1000.16.4.09 as N° 2618

Transmission, Mortgages N° 2606 and 2618: John Jameson to Arthur Middleton Brodick and Arthur Magnus Irvine.  
Registered 1100.12.11.18 as N° 3375

Mortgage: James Mackenzie to Arthur Middleton Brodick and Arthur Magnus Irvine.  
Registered 1030.16.12.14 as N° 3489

Mortgage: James Mackenzie to Margaret Selina Hayes.  
Registered 1030.16.12.14 as N° 3490

Assignment  $\frac{1}{2}$  share: James Mackenzie to John Robert Webb.  
Registered 1100.13.7.15 as N° 3529

Mortgage: John Robert Webb to James Mackenzie.  
Registered 1100.13.7.15 as N° 3530

Sub-Mortgage: James Mackenzie to Alexander Bachop.  
Registered 1000.6.8.15 as N° 3584

Assignment  $\frac{1}{2}$  share: The Mayor Councillors and Burgesses of the Borough of Cromwell to George Mouldie and Herbert Charles Bilton.  
Registered 1100.4.11.16 as N° 3601

Sub-Mortgage: James Mackenzie to Alexander Samuel Adams.  
Registered 1000.7.11.16 as N° 3602

Discharge Mortgage N° 2606: Arthur Middleton Brodick and Arthur Magnus Irvine to George Scott.  
Registered 1015.3.10.17 as N° 3677

Transmission: William Stephens to Mary Jane Stephens.  
Registered 1210.26.4.18 as N° 3724

Sub-Mortgage: James Mackenzie to Arthur Middleton Brodick.  
Registered 1500.28.11.18 as N° 3767

Assignment  $\frac{1}{2}$  share: Mary Jane Stephens to Richard George Redhead.  
Registered 1130.16.12.18 as N° 3773

Assignment  $\frac{1}{2}$  share: Mary Jane Stephens to Joseph Duncombe Winter.  
Registered 1530.6.12.18 as N° 3775

Mortgage: Joseph Duncombe Winter to Mary Jane Stephens.  
Registered 1530.16.12.18 as N° 3776

Assignment  $\frac{1}{2}$  share: Michael Louis Spratt to William Tisdall.  
Registered 1000.4.11.19 as N° 3837

Mortgage: William Tisdall to R. Wilson & Co. Ltd. and Simpson & Hart Ltd.  
Registered 1000.4.11.19 as N° 3839

Mortgage: William Tisdall to Michael Louis Spratt.  
Registered 1000.4.11.19 as N° 3838

Assignment  $\frac{1}{2}$  share: Richard George Redhead to William Thomas.  
Registered 1100.1.5.20 as N° 3888

Assignment Mortgage N° 3838: Michael Louis Spratt to Theodore Russell.  
Registered 1045.1.6.20 as N° 3894

Assignment  $\frac{1}{2}$  share: Joseph Duncombe Winter to Mary Jane Thomas.  
Registered 1445.30.6.20 as N° 3902

Discharge Mortgage N° 3776: Mary Jane Stephens to Joseph Duncombe Winter.  
Registered 1445.30.6.20 as N° 3903

Endorsement  
Right N°2268 to continue  
to use and maintain the  
race described in Licence  
N°4908, Cromwell Registry  
(Endorsement pursuant to S.24(5)  
of The Water & Soil Conservation  
Amendment Act 1971 )

103

Board

to

John Inwood Bilton

Right granted by the Otago Regional  
Water Board, Dunedin, on 13 December 1982  
endorsement  
and recorded as No. 634 W

Brendan R. Mooney  
pp Secretary

Assignment of  $\frac{1}{84}$   
Thomas Brierly Pasley  
to  
Douglas Allan Cockerell  
and  
Odette Maria Cockerell

Notice received at the office of the Otago Regional  
Water Board, Dunedin, on 17 October 1983  
and recorded as No. 655 W.

Brendan R. Mooney  
pp Secretary

Assignment  $\frac{1}{42}$   
Joannes Gysbertus Arnoldus Belt  
to  
Kenneth Moody  
and

Vivienne Joan Moody

Notice received at the office of the Otago Regional  
Water Board, Dunedin, on 1 October 1984  
and recorded as No. 682 W.

Brendan R. Mooney  
pp Secretary

Mortgage: Mary Jane Thomas to Arthur Middleton Brodick and Arthur Magnus Irvine.  
Registered 1163.30.6.20 as N° 3904

Transmission Sub-Mortgage N° 3534: Alexander Bachop to Thomas Bachop.  
Registered 1000.6.9.20 as N° 3922

Assignment Sub-Mortgage N° 3534: Thomas Bachop to Bertha Brodick.  
Registered 1000.1.10.20 as N° 3928

Transmission: James Mackenzie to Thomas Mackenzie  
Registered 1000.4.4.21 as N° 3985

Assignment Mortgage N° 3602: Alexander Samuel Adams to Mrs. A. Mackenzie.  
Registered 1100.30.8.21 as N° 4012

Discharge Mortgage N° 3894: Theodore Russell to William Tisdall.  
Registered 1100.24.7.23 as N° 4177

Assignment  $\frac{1}{2}$  share: William Tisdall to George Scott.  
Registered 1230.5.10.23 as N° 4193

Assignment  $\frac{1}{2}$  share: William Tisdall to George Moodie and Herbert Charles Bilton.  
Registered 1230.5.10.23 as N° 4194

Discharge Mortgage N° 3839: R. Wilson & Co. Ltd. and Simpson & Hart Ltd. to William Tisdall.  
Registered 1000.18.10.23 as N° 4203

Assignment  $\frac{2}{3}$  share: William Tisdall to Robert Haig.  
Registered 1000.12.3.24 as N° 4259

Mortgage: Robert Haig to William Tisdall.  
Registered 1000.12.3.24 as N° 4260

Transmission: Arthur Magnus Irvine to Arthur Middleton Brodick.  
Registered 1000.13.3.25 as N° 4455

Assignment Mortgage 3530: Thomas Mackenzie to Annie Mackenzie.  
Registered 1000.18.9.25 as N° 4556

Discharge Sub-Mortgage N° 3602: Alexander Samuel Adams to Annie Mackenzie.  
Registered 1000.18.9.25 as N° 4557

Assignment Mortgages N° 2618 & 3489: Arthur Middleton Brodick to Arthur Middleton Brodick and Seaward James Cantrell.  
Registered 1000.24.3.26 as N° 4632

Variation Mortgage N° 3904: Mary Jane Thomas to Arthur Middleton Brodick.  
Registered 1000.9.9.26 as N° 4715

Sub-Mortgage of Mortgage N° 3904: Arthur Middleton Brodick to George Stumbles.  
Registered 1500.9.9.26 as N° 4716

Discharge Mortgage N° 4260: William Tisdall to Robert Haig.  
Registered 1000.10.10.27 as N° 4891

Mortgage: Robert Haig to Isaac Stevenson.  
Registered 1000.10.10.27 as N° 4892

Assignment  $\frac{1}{2}$  share: Robert Haig to George Moodie.  
Registered 20.12.28 as N° 5032

Transmission: John Robert Webb to Public Trustee.  
Registered 7.1.29 as N° 5033

Assignment  $\frac{1}{4}$  of  $\frac{2}{3}$  share for 2 days per week: Robert Haig to Frank Peacock.  
Registered 1000.12.2.29 as N° 5042

Discharge Mortgage N° 4892: Isaac Stevenson to Robert Haig.  
Registered 1000.7.3.29 as N° 5046

Assignment 2" pipe supply: Robert Haig to Frank Peacock.  
Registered 1000.7.3.29 as N° 5047

Mortgage: Robert Haig to George Stumbles and Ernest Jolly.  
Registered 9.5.29 as N° 5063

Discharge Mortgage N° 5063: George Stumbles and Ernest Jolly to Robert Haig.  
Registered 1000.14.12.29 as N° 5096

Assignment of interest: Robert Haig to Henry Thomas Orr.  
Registered 1000.14.12.29 as N° 5097

Mortgage: Henry Thomas Orr to William Brown.  
Registered 1000.14.12.29 as N° 5098

Discharge Mortgages and Sub-Mortgages N° 2618, 3489, 3490, 3530, 3534, 3767: Arthur Middleton Brodick and S.J. Cantrell as joint mortgagors in full James Mackenzie to James Mackenzie; Ann Brodick and S.J. Cantrell to James Mackenzie; Margaret Selma Hayes to James Mackenzie; Annie Mackenzie to John Robert Webb; Bertha Brodick to James Mackenzie; Ann Brodick to James Mackenzie.  
Registered 1000.5.2.30 as N° 5101

Assignment: Public Trustee to Florence Webb.  
Registered 1000.5.2.30 as N° 5102

Mortgage: Florence Webb to State Advances Corporation.  
Registered 1000.5.2.30 as N° 5103

Mortgage: Henry Thomas Orr to Stronach Morris & Co Ltd.  
Registered 1000.11.3.31 as N° 5178

Assignment  $\frac{1}{2}$  share: William Thomas to Mary Jane Thomas.  
Registered 0930.3.4.35 as N° 6229

Discharge Mortgage N° 5178: Stronach Morris & Co Ltd. to Henry Thomas Orr.  
Registered 0930.27.3.36 as N° 6434

Discharge Mortgage N° 4716: George Stumbles to Arthur Middleton Brodick.  
Registered 1100.9.4.36 as N° 6451

Discharge Mortgage N° 3904: Arthur Middleton Brodick to Mary Jane Irvine.  
Registered 1100.9.4.36 as N° 6452

Mortgage: Mary Jane Thomas to Henry Burrows.  
Registered 1430.20.4.36 as N° 6457

Discharge Mortgage N° 5098: William Brown to Henry Thomas Orr.  
Registered 1115.16.5.36 as N° 6462

Partition of Interests ( $\frac{1}{2}$  share each) George Moodie and Herbert Charles Bilton.  
Registered 1530.13.8.36 as N° 6490

Mortgage: George Moodie to National Bank of N.Z.  
Registered 1045.20.7.38 as N° 6678

Assignment: George Moodie to George Stewart Moodie.  
Registered 0930.17.2.39 as N° 6719

Mortgage: George Stewart Moodie to Reillys Central Produce Mart.  
Registered 0930.17.2.39 as N° 6720

Discharge Mortgage N° 6678: National Bank of N.Z. to George Moodie.  
Registered 1400.22.2.39 as N° 6722

Transmission: Herbert Charles Bilton to Jessie Ann Margaret Bilton.  
Registered 1440.28.8.41 as N° 6918

Transmission: Mary Jane Thomas to Public Trustee.  
Not registered against this licence, but should have been; N° 7130

Discharge Mortgage N° 6720: Reillys Central Produce Mart to George Stewart Moodie.  
Registered 1300.4.4.45 as N° 7175

Assignment: George Stewart Moodie to George William Carrington and Martha Lena Carrington.  
Registered 1300.4.4.45 as N° 7176

Assignment: Florence Webb to Harry Joseph Webb and John Ewart Webb.  
Registered 1000.8.3.46 as N° 7254

Assignment: Henry Thomas Orr to William Henry Parram.  
Registered 1530.2.10.46 as N° 7317

Renewal, 42 years from 4.9.44  
Registered 1000.16.8.50 as N° 7722

Transmission: George Scott to Williamina Scott and Frederick George Duncan.  
Registered 1000.17.5.51 as N° 7826

Transmission: Jessie Ann Margaret Owen to John Howard Bilton.  
Registered 0900.19.2.52 as N° 7923

Transmission Mortgage N° 6657: Harry Burrows to Public Trustee.  
Registered 1500.18.3.52 as N° 7933

Discharge Mortgage N° 6657: Public Trustee to Mary Jane Thomas.  
Registered 1500.18.3.52 as N° 7934

Assignment: Public Trustee to William James Stephens.  
Registered 1100.24.6.52 as N° 7957

Assignment: George William Carrington and Martha Lena Carrington to Clifford Keith George.  
Registered 1600.4.5.53 as N° 8111

Mortgage: Clifford Keith George to State Advances Corporation.  
Registered 0900.5.5.53 as N° 8112

Mortgage: Harry Joseph Webb and John Ewart Webb to State Advances Corporation.  
Registered 1100.16.7.56 as N° 8623

Certificate of Easement, W.R. 8633 in within licence: Warden to Harry Joseph Webb and John Ewart Webb.  
Registered 1000.13.9.57 as N° 8813

Assignment  $\frac{1}{2}$  share: John Howard Bilton to Clifford Keith George.  
Registered 1000.21.3.58 as N° 8879

Mortgage: Clifford Keith George to State Advances Corporation.  
Registered 1100.21.3.58 as N° 8881

Assignment: William Henry Parram to John Howard Bilton.  
Registered 1400.23.5.58 as N° 8897

Transmission: Frederick George Duncan to Williamina Scott.  
Registered 1050.26.9.67 as N° 10612

Assignment  $\frac{1}{2}$  share: Williamina Scott to John Hector McGregor.  
Registered 1055.26.9.67 as N° 10613

Transmission: Frederick George Duncan to Williamina Scott.  
Registered 1145.23.6.58 as N° 10739

Assignment  $\frac{1}{2}$  share: Williamina Scott to John Hector McGregor.  
Registered 1155.23.6.58 as N° 10740

Discharge Mortgage N° 5103: State Advances Corporation to Florence Webb.  
Registered 1500.22.5.68 as N° 10791

Discharge Mortgage N° 8623: State Advances Corporation to Harry Joseph Webb and John Ewart Webb.  
Registered 1530.22.5.68 as N° 10792

Assignment (with reservation): Harry Joseph Webb to John Ewart Webb.  
Registered 1530.22.5.68 as N° 10794

Mortgage: John Ewart Webb to Bank of N.Z. Savings Bank Ltd.  
Registered 1610.22.5.68 as N° 10795

Mortgage: John Ewart Webb to Bank of N.Z.  
Registered 1600.22.5.68 as N° 10796

Assignment  
Harry Joseph Webb  
to  
Thomas Briarly Rasley

Notice received at the office of the Otago Regional

Water Board, Dunedin, on 17th May 1974

and recorded as No. 079 W.

Brian Mooney  
pp Secretary

[illegible]

OTAGO CATCHMENT BOARDRIGHT TO CONTINUE TO USE AND MAINTAINAN EXPIRED MINING PRIVILEGE

Pursuant to Section 24 (1) of the Water and Soil Conservation Amendment Act 1971, the Otago Catchment Board, being the Regional Water Board for the Otago Catchment District, hereby grants to:

Name: John Clement Anton Lucas

Address: C/o Caudwells, P.O. Box 957, Dunedin

the right to continue to use and maintain the race described in Licences Nos. 3137 and 4933, Cromwell Registry, for the purpose of the exercise of Right No. 2950A.

Subject to the General Conditions set out below:

GENERAL CONDITIONS

1. This right shall be deemed to confer upon the holder hereof the same rights, powers and duties as did the expired mining privilege in replacement of which it has been granted; except where such rights, powers or duties may conflict with any other of the General Conditions listed below, or with any Special Condition of this Right.
2. Grantee shall not alter the intake of the water, or use for diverting the water any race other than the race authorised by this Right.
3. Grantee shall not have any right or remedy whatsoever against any person in respect of the discharge of tailings, debris, refuse, or waste water into any watercourse by that person in the lawful carrying on of mining operations within the meaning of the Mining Act 1971.
4. Grantee shall maintain in good repair, order, and condition, to the satisfaction of the Board, all bridges and culverts permitting public or private access over water races.

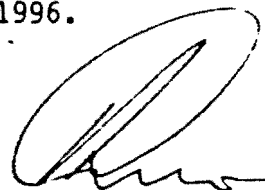
Legal description of lands affected: Parts Run 237G Blocks IV, III and I Cluden Survey District.

Special Condition:

That grantee shall co-operate with the holder of Right No. 29588 in their use and maintenances of that part of the race granted by Licence No. 3137.

This right will expire at 12 noon on 1 February 1996.

Issued at Dunedin the 27th day of March 1986.



R.W. SCOTT  
SECRETARY

## PRIORITY LISTING

## LINDIS RIVER MINING PRIVILEGES

WR7787/96Cr, 13.8.1986, 500,000  $1.h^{-1}$ , Lindis River, Crown, subject to Deed 6179Cr;

WR801Cr, 11.10.1901, 200,000  $1.h^{-1}$ , Deep Creek, John Jenkins;

WR1753Cr, 8.7.1905, 1,000,000  $1.h^{-1}$  (but see Note 1), Lindis River, Crown, extra water in WR7787/96Cr, subject to Deed 6179Cr;

WR2708Cr, 9.9.1909, 1,200,000  $1.h^{-1}$ , Lindis River, John Alexander Lethbridge 1/4, Edna May Lethbridge 1/4, Alistair Askin Rutherford 1/4, Suzanne Elizabeth Rutherford 1/4, was subject to Deed 8050Cr;

WR2709Cr, 9.9.1909, 200,000  $1.h^{-1}$ , Waiwera Stream, John Alexander Lethbridge and Others (as for WR2708Cr, above);

WR2802Cr, 10.2.1910, 5,000,000  $1.h^{-1}$ , Lindis River, Crown, was affected by Deed 8050Cr;

WR2812Cr, 10.3.1910, 400,000  $1.h^{-1}$ , Wanui Stream, Crown 1/2, Donald Alan Young 1/2;

WR2873Cr, 16.6.1920, 350,000  $1.h^{-1}$  Lindis River, Ardgour Run Ltd;



WR3078Cr, 26.8.1911, 200,000  $1.h^{-1}$ , Long Spur Creek, Brian Alexander McCaughan;

WR3079Cr, 26.8.1911, 200,000  $1.h^{-1}$  Little Rocky Hill Creek, Brian Alexander McCaughan;

WR3080Cr, 26.8.1911, 600,000  $1.h^{-1}$ , Lindis River, John Clement Anton 3/5, Peter Coven Heath Davis 1/5, John Davis Lunn Davis 1/5;

WR3137Cr, 11.11.1911, 300,000  $1.h^{-1}$ , Cluden Stream, John Clement Anton Lucas 11/12, Peter Coven Heath David 1/24, John Davis Lunn Davis 1/24;

WR3448Cr 2.8.1914, 200,000  $1.h^{-1}$ , Timburn, Peter Coven Heath Davis, John Davis Lunn Davis 1/2;

WR3587Cr, 2.8.1916, 200,000  $1.h^{-1}$ , McKenzie's Creek, William Raymond Patterson;

WR3665Cr, 4.7.1917, 300,000  $1.h^{-1}$ , Wanui Stream, Peter Lyall Anderson 1/3, Janet Ellen Anderson 1/3, Trust (Janet Ellen Anderson, Leslie James William Stewart, Roger Norman Macassey) 1/3;

WR3757Cr, 11.9.1918, 50,000  $1.h^{-1}$  Eight Mile Creek, James Gordon Lucas;

WR3805Cr, 20.6.1919, 100,000  $1.h^{-1}$ , Nine Mile Creek, James Gordon Lucas 3/5 Hazel Edith Lucas 1/5, Robert Cameron White 1/5;

WR4083Cr, 22.3.1922, 600,000  $1.h^{-1}$ , Lindis River, Crown;

WR4836Cr, 11.5.1927, 400,000 l.h<sup>-1</sup>, Tributary of Tarras Creek, Crown

WR4837Cr, 11.5.1927, 600,000 l.h<sup>-1</sup>, Tributary of Tarras Creek, Crown;

WR5083Cr, 7.8.1929, 200,000 l.h<sup>-1</sup>, Timburn, Peter Coven Heath Davis, John Davis  
Lunn Davis 1/2;

WR5950Cr, 7.3.1934, 400,000 l.h<sup>-1</sup>, Station Creek, Russell Stewart Emmerson;

WR8546Cr, 7.12.1955, 100,000 l.h<sup>-1</sup>, Shepherds Creek, Ardgour Run Ltd.

---

The above list is in order of priority.

Omitted from the list are two takings of water (from springs) claimed by notice under s.21(2) to be lawful under the Public Works Act 1928. The priority of such uses would presumably date from the promulgation of the appropriate Order-in-Council.

**APPENDIX FIVE**

<b>Research Method</b>	<b><u>Page No</u></b>
5.0 Research Method	111
5.1 Sketch of Research Method	113
5.2 List Data Sources	114
5.3 People Interviewed	114

## 5.0 Research Method

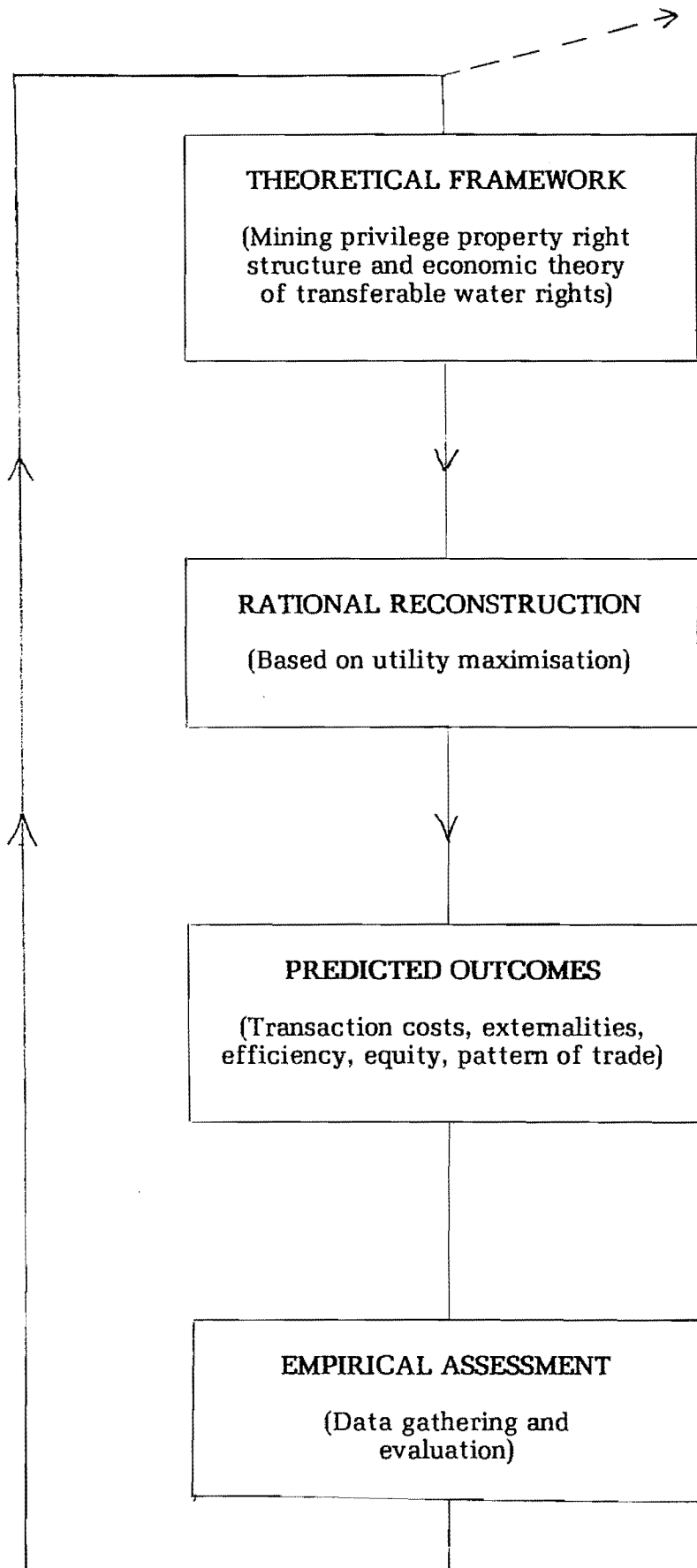
The first step in the study was to establish an analytical framework. Initially, contemporary economic theory of transferable property rights to water was reviewed. Next the property rights structure governing the use of water under the mining privilege system, and how the structure changed over time was examined. The economic theory highlighted the conditions under which a water market was likely to operate efficiently. Detailing the mining privilege property rights structure established whether efficiency conditions were present, delimited individual choice domains, and hence the opportunity set for water resource use decisions.

Having established a theoretical framework the method of rational reconstruction was used to predict outcomes in terms of the externalities, transactions costs, equity and efficiency of the mining privilege system. The method of rational reconstruction is based on the premise that individuals act rationally in response to constraints, opportunities and incentive structures they confront. It was assumed the common denominator of individual choice domains was personal gain, and that this took precedence over other motivating factors. Thus, to act rationally was to act in a manner which maximised personal gain. Although this is a narrow definition of rationally it was thought to be appropriate to the research context. In an environment where water had a high scarcity value actors were faced with making substantial economic decisions; personal gain would have ranked high on their agenda.

Having formulated a series of predicted outcomes, evidence was sought to either support or refute these conjectures. As many different data sources as possible were used. Both qualitative and quantitative data was examined. The study was not a static step by step process. Rather the theoretical framework used and the research findings were continually modified or adapted by reintroducing data obtained in later steps to earlier steps. This iterative and adaptive process continued until no significant alterations to findings emerged. An outline of the research method, sources of data used and the people interviewed in the study are recorded below.

## 5.1 Sketch of Research Method

Final Report



## 5.2 Data Sources

National Archive Material : Petitions to and minutes of the Goldfields and Mines Committee 1898–1919. New Zealand Parliamentary Debates 1898–1919. New Zealand Appendices to the Journals of the House of Representatives 1898–1919. Wardens Court Case History. Hocken Library. Historical literature relating to early Otago.

Contemporary theory on transferable property rights to water and general property right literature. Interviews with people, as listed below.

## 5.3 People Interviewed

Euan Carr	Farmer, entrepreneur and private water right holder, Patearoa, Central Otago;
Kevin Carry	Director, Otago Catchment Board, Dunedin
Ron Division	Farmer , private water right holder and Chairman Vincent City Council, Central Otago, Tarras.
Lloyd Hinchy	Farmer, private water right holder and Otago Catchment Board member. Now retired. Alexandra, Central Otago.
Bruce Greer	Farmer, Chairman of the Otago Private Water Right Holders Association. Retired farmer, Pateroa, Central Otago.
Terry Hearn	Lecturer – Extension Studies, University of Otago. Historian and geographer with expertise in early Central Otago history.
Gavin Herlihy	Farmer, Patearoa, Central Otago. MSc Agriculture Science.

Roy Ferrans	Otago Catchment Board staff member, administers mining privileges.
Brian Mooney	Otago Catchment Board staff member, administers mining privileges.
Ian Keynes	Manager of Resources and Planning Hawkes Bay Catchment Board.
Hank Stocker	District Soil and Conservation Officer. Ministry of Works and Development, Central Otago.



**APPENDIX SIX****Water Allocation: Efficiency Conditions**Page No

Efficiency Conditions

117

## WATER TRANSFERS: EFFICIENCY CONDITIONS

The creation of binding flow constraints has important implications for the efficiency conditions for water resource allocation. These are explored here with the use of a simple model.<sup>1</sup> Imagine a stream which has a flow at the source of  $\hat{S}$  units of water per unit time. If the amount of water user  $i$  diverts is denoted by  $S_i$  and the  $i$ th. user's return flow is  $R_i$ , then  $(1-R_i)S_i$  represents the  $i$ th abstractor's consumptive use. Now assume a flow of  $\bar{S}$  must exist at some downstream point. The maximum volume of water available for appropriation by  $n$  users sequentially located along the stream is the difference between  $\hat{S}$  and  $\bar{S}$ . The minimum flow requirement could reflect the amount needed by an existing appropriator or alternatively an instream right.

Now assume for each of the  $n$  users there exists a function,  $F_i(S_i)$ , representing the marginal product of water diverted. Further assume that the cost of diversion  $C_i$ , the purchase of pumps and the construction and maintenance of other devices, is a function of the volume of water diverted. Thus the net value of the marginal product of water diverted is:

$$(1) \quad \text{NVMP} = F_i(S_i) - C_i(S_i) \quad i = 1, 2, \dots, n$$

If we assume the water course is fully appropriated the resource use optimisation problem becomes one of maximising:

$$\sum_{i=1}^n \int_0^{S_i} (F_i(\alpha_i) - C_i(\alpha_i)) d\alpha_i$$

---

1 The model developed here is based on one used by Johnson, et. al. (1981) The Definition of A Surface Water Right and Transferability in the Journal of Law and Economics 24: 273-88.

Subject to  $S_i \geq 0$  and

$$\begin{aligned}
 S_1 &< \hat{S} \\
 S_2 &< \hat{S} - (1-R_1) S_1 \\
 &\vdots \\
 S_n &< \hat{S} - (1-R_1) S_1 - (1-R_2) S_2 \dots (1-R_{n-1}) S_{n-1} \\
 \bar{S} &< \hat{S} - (1-R_1) S_1 - (1-R_2) S_2 \dots (1-R_n) S_n
 \end{aligned}
 \tag{2}$$

The flow constraints  $i = 1 \dots n$  represent the requirement that flow at any point of diversion is not less than the amount diverted. The final constraint represents requirement of the instream appropriation  $\bar{S}$ , further downstream. The probability that any of the  $n$  flow constraints is binding will in part be dependant on the relative sizes of  $\bar{S}$  and  $\hat{S}$ . If the river flow between  $\hat{S}$  and  $\bar{S}$  is large relative to diversion none of the  $n$  constraints need to be binding.<sup>21</sup> In this case if we employ the appropriate Lagrangian equation;

$$L(S_i, \lambda_i) = \sum_{i=1}^n (F_i(S_i) - C_i(S_i)) d(\alpha_i) + \lambda \left[ \hat{S} - \bar{S} - \sum_{i=1}^n S_i (1-R_i) \right]$$

the optimum solution yields:

$$(4) \quad [F_i(S_i) - C_i(S_i)] / (1-R_i) = \lambda \hat{c}, \quad i = 1, 2, 3 \dots n.$$

Equation (4) reveals that if total value is to be maximised along the stream the value of the net marginal product of consumptive use<sup>22</sup> must be equal across all users. This is the traditional micro economic equilibrium condition for efficient resource allocation.

21 Ibid P. 287

22 Dividing the net value of the marginal product of water,  $F_i(S_i) - C_i(S_i)$  by the fraction consumed,  $(1-R_i)$  transforms it into the net marginal product of consumptive use.

## REFERENCES

- Anderson, T.L. 1985 "The Market Alternative for Hawaiian Water Natural Resources Journal", 25: 993 910.
- Anderson, Terry L. ed 1983. Water Rights Scarce Resource Allocation, Bureaucracy, and the Environment. Ballinger Publishing, Cambridge Massachusetts.
- Anderson, Terry.L and Johnson Ronald.N 1986. The Problem of Instream Flows. Economic Inquiry, 24 October: 535 554.
- Burness, H Stuart and James P Quirk. 1980a. Appropriative Water Rights and the Efficient Allocation of Resources. American Economic Review. 69(1):25-37.
- Burness, H.B and J.F Quirk 1980a. Economic Aspects of Appropriative Water Rights. Journal of Law and Economics. 23: 111-134.
- Burness, H.B and J.F Quirk. 1960. Water Law, Water Transfers and Economic Efficiency. The Colorado River, Journal of Law and Economics. 23 111-134.
- Carstens, 1984 Irrigation in Central Otago MWD Internal Report.
- Carran, P and Painter D. What is Irrigation Efficiency? in Soil and Water Oct 1978.
- Cathcart, R W. et.al. 1983. Rakaia River Catchment and Central Plains - Draft Management Plan. North Canterbury Catchment Board and Regional Water Board, Christchurch.
- Chaung, Steven, N.B 1969. Transaction Costs, Risk Aversion and the Choice of Contractual Arrangements Journal of Law and Economics. 12(1):23-42. HD1586.
- Coase R H. 1960. The Problem of Social Cost, Journal of Law and Economics. 3:1-44.
- Demsetz Harold. 1967 Towards a Theory of Property Rights. American Economic Review 57:348-359.
- Ditwiler C D 1975. Water Problems and Property Rights - Economic Perspective, Natural Resources Journal, 15:663-680.
- Engelbrecht, Rayds, Tavendale and Co Ltd, 1986 Survey Report on Irrigation Charges, Water Quotas and Scheme Management in the Older Central Otago Irrigation Schemes.
- Frederick, Kenneth D eds. 1986 Scarce Water and Institutional Change. Publisher, Resources for the future, Inc, Washington, DC.
- Fox, Irving K 1976. Institutions for Water Management in a Changing World, Natural Resources Journal, 16:743-58.
- Galabresi, G. Transaction Cost and Liability Rules - A Comment. Economica 11:67-74
- Hartman, L M and D A. Seastone 1965. Efficiency Criteria for Market Transfers of Water, Water Resources Research. 1(2):165-71.
- Hearn T J. Riparianism, Prior Appropriation and the Development of Irrigation in Central Otago 1865 - 1920. New Zealand Geographer 1982.

Hearn, T.J. 1981. Land, Water and Gold in Central Otago 1861-1921 Some aspects of resource use policy and conflict PHD Geography, Otago University.

Hide, P.Rodney. 1987. Property Rights and Natural Resource Policy Published by Centre for Resource Management University of Canterbury and Lincoln College.

Hide, Rodney and Sharp, Basil. 1987. Piecemeal Reform of Water Resource Institutions Paper to the New Zealand Association of Soil Conservators Conference.

Hide, Rodney and Sharp, Basil. 1987 A critical Examination of Subsidy to Catchment Works and Proposals for Reform Final Report to the Treasury and the Ministry of Works and Development. Published by Centre for Resource Management University of Canterbury and Lincoln College.

Johnson, Ronald N and Micheal Gisser. 1981 The Definition of Surface Water Rights and Transferability. Journal of Law and Economics, 24(Oct):273-88.

Kakanui River Catchment Draft Management Plan. 1987. Otago Catchment Board and Regional Water Board Dunedin.

Livingston, M.L 1985 Treating Water Institutions as Endogenes Variables: Demonstration of a Conceptual Model, Water Resources Bulletin, 21(1): 23-9.

Livingston, Marie.Leigh and Miller, Thomas.A. 1986. A Framework for Analysing the Impact of Western Instream Water Rights on Choice Domains : Transferability, Externality, and Consumptive Use. Land Economics, 62(3):269-77.

Milne, P.J. 1985. Water Resource Allocation and Management in New Zealand. New Zealand Universities Law Review. 11:245-71.

Organisation for Economic Co-operation and Development Use of Water Rights: Recent United States Developments in Water Markets. Environment Directorate 1987.

Organisation for Economic Co-Operation and Development. Existing Legal Regimes and Requirements for Efficient Management of Water Resources in OECD Countries. Environment Directorate 1987.

Otago Catchment Board 1978 Report on a meeting of Sub-Committee appointed to consider aspects relating to privileges in respect of water.

Otago Catchment Board. Papers on Mining Privileges W78/78, W78/10, W80/45.

Otago Catchment Board 1973 Problems Created by Part 1 of 1971 (No 24) Amendment to the Water and Soil Conservation Act.

Otago Catchment Board 1985 A History of Water Resource Management in the Clutha.

Otago Private Water Right Holders Association. 1977 Paper on proposed reform of mining privilege legislation.

Palmer Kenneth A. 1984 Planning and Development Law in New Zealand Vol II The Law Book Company Ltd.

Parcell, Crambie James 1976 Heart of the Desert. Whitcoulls Publishers New Zealand.

- Posner, R.A. 1977 Economic Analysis of Law. Boston Little Brown & Co
- Randall, A. 1975 Property Rights and Social Micro-Economics Natural Resource Journal 15:729-738.
- Randall, A. 1981. Resource Economics : An Economic Approach to Natural Resource and Environment Policy. Grid Publishing Inc.
- Skelton P R. 1985 Sharing Water a legal perspective in New Zealand Agricultural Science. 19:145-151.
- Smith, C. Stephen and Castle, N. Emery. eds. 1964 Economics and Public Policy in Water Resource Development. Iowa State University Press.
- Warden's Court Journals, Blacks Complaint Books and Register 1866-1921, Case History as cited in Appendix 2. Held in Hocken Library Dunedin - Not Catalogued.
- Waikato Valley Authority 1982 Direct Charging for Beneficial Use of Water Hamilton New Zealand.
- Water and the Problems of Price Regulation in an Age of Privatisation. in Public Finance and Accountancy, July 25, 1986.

## 1.0 Introduction

This postscript is a critical appraisal of my 604 that was completed in February 1988. The appraisal begins by assessing the theoretical approach I used. A critical review is then made of the project's content, structure and research method.

### 1.1 Theoretical Approach

Property right theory formed the basis of my comparative institutional analysis. This theory recognises the existence of transaction costs and externalities, thus providing a means of assessing the effects of different institutional arrangements on resource allocation. This overcomes a significant limitation of the neoclassical economics model that assumes externalities and transaction costs are zero thus, yielding an efficient resource allocation for any arrangement of property rights. I used transaction cost analysis to assess alternative property right arrangements to water and to predict outcomes of the Otago water market.

Transaction costs are only one of many criteria that can be used to compare alternative institutional arrangements. As a criteria, transaction costs were an inadequate tool to examine the nature of and rationale for government's involvement in allocating water resources (i.e. the final section of the report). For this section of the analysis, I relied on the knowledge I had acquired in Natural Resource Policy 621. Thus in my assessment of government's role, I used equity and efficiency criteria and concepts such as the "free rider", public goods and the distribution of costs and benefits between key actors competing for water resources. In retrospect, the use of additional criteria such as contestability, transactions frequency, accountability, propensity for error correction and transparency would have resulted in a more comprehensive analysis.

## 1.2 Critique of Content/structure

The critique below is divided into three parts, each examining one of the three main sections of my report.

### 1.2.1 Water Transfers: Contemporary Theory

This section of the report presents a comprehensive review of contemporary theory relating to transferable water rights as well as a critique of how water rights have been delimited and allocated in New Zealand.

On page 5 the statement that "property rights to water can be specified in a manner which internalises costs and benefits, minimises costs of specification and enforcement, and thus ensures transaction costs are kept to a minimum" is inconsistent with my analysis. The method of transferring water rights will also influence transaction costs, for example, whether transfers are a purely between private individuals or are overseen by a public body. Furthermore, different property right arrangements will generate different transaction costs as they influence risks associated with appropriability i.e. the certainty that an actor will capture the intended benefits from a water right transfer. Minimising specification and enforcement costs will not necessarily increase certainty that the intended benefits of a transfer will be realised. My analysis examined the effect of uncertainty on transaction costs on page 7. The statement on page 5 is inconsistent with my analysis.

### 1.2.2 The Mining Privilege System of Water Allocation: An economic analysis

This section is a summary of my research findings on the Otago water market. The complete analysis of the Otago situation is contained in the first three appendices of the report. Most of it is original research as no one had studied the early Otago water market in any detail. The



results were applied towards an understanding of how a water market in New Zealand could be organised. The generalised application of the Otago study fulfilled the requirements of my research contract with Treasury. An alternative, more focused, use of the research findings, would be as a case study to evaluate the accuracy of contemporary theoretical models of water market behaviour. The data clearly supports several predictions made by water market models.

### 1.2.3 A Market For Water In New Zealand

Shortcomings of this section of the report, along with a discussion of suggested improvements, are listed below.

-In my discussion of the initial allocation of water rights (P. 36 and 37) it would have been an appropriate place to raise the prospect of Maori ownership, rather than later in the report. This is a matter of report structure.

The Central Districts Catchment Boards have decided to grant an increased minimum flow " in recognition of the spiritual, cultural and traditional fishing value of the Wanganui River to the Wanganui Maori..." (Wanganui Minimum Flow Review, 1988, P. 22). The Te Tikanga Tribal Authority responded by attempting to collect a rental from jet boat operators and canoeists (Christchurch Press 12/11/88). This demonstrates Maoris are willing to trade water rights. Information of this nature, at the time of writing, would have enhanced my brief discussion of Waitangi Treaty issues.

-On page 41 I discuss the Crown's "monopoly advantage" in supplying water. "Monopoly advantage" infers the Crown is able to manipulate prices because of the size of its market share. I related monopoly advantage to the nature of the Crown's transaction costs. This is a very dubious suggestion. The report provides no clear argument to support the suggestion that transaction costs will affect market advantage. The paragraph concerned could be removed without any further alterations to the report.

-On page 43 I concluded that "Where consumptive use is used as a measure of transferability, an objection process need not constrain transfers. This is an optimistic statement. The potential for objections to arise will depend not only on the nature of the property rights being reassigned, but also on hearing procedures, rights of standing; and individual and institutional agendas, both open and hidden; that may appear to have little obvious relation to the proposed exchange of property rights. A more appropriate conclusion is that delimiting rights on the basis of consumption would reduce the likelihood of objections to transfers.

-My argument for national rather than regional management and allocation of instream rights would have been strengthened by reference to Gresham's law of regulatory laxity. Rowland and Marz (1982) argue that locating regulatory functions regionally may encourage competition between different jurisdictions to attract industry. The existence of instream rights would diminish the supply of consumptive rights and hence raise the price of water on the market. Industries would take the price rise into account when making location decisions. Regional authorities may then view instream rights as having an opportunity cost in terms of regional employment and respond by reducing the quantity of such rights.

-I suggested that the Department of Conservation could manage instream rights and that this may present problems of accountability (P. 45 - 46). I could have suggested accountability would be strengthened by allocating instream rights to both the Department of Conservation and the Acclimatisation Society. Allocating water rights to the Acclimatisation Society would open up further avenues for public participation.

### 1.3 Research Method

The basis of my research method was "rational reconstruction". This assumed participants in the water market would act in an economically rational manner, using personal economic gain as the criteria for most decisions. Given the constraints and opportunities faced by actors in the water market, predictions about market outcomes were then "rationally constructed". I originally defended the use of the "self-maximising" assumption by identifying the potentially enormous economic gain for individuals from exchanges of water (P. 111). I now realise that a better defence of my research method is possible.

A common criticism of the model of rational economic man is that people are not self-interested maximisers. Otway (1982) suggests people act rationally in as far as they act in accordance with their beliefs and values to achieve their goals. Viewed in this way, "economic rationality" is a subset of Otway's definition of rational behaviour. To act in an economically rational manner does not automatically imply people are innately self interested. What appears as rational economic behaviour may simply be the result of people acting in accordance with their beliefs.

The beliefs and rules with which we structure social behaviour can loosely be termed institutional arrangements. In turn, the behaviour of rational economic man can be viewed as being specific to a particular institutional arrangement. Thus, the validity of my research method is not dependent on my assumption that individuals are self maximisers. The "nature" of man is redundant to the analysis. The method used was appropriate to the institutional context- a water market.

#### 1.4 Conclusion

My theoretical approach was dominated by private property right theory and the role transaction costs play in the allocation of resources. Transaction cost analysis was a useful tool with which to assess different arrangements of water rights. However, property rights theory was not adequate to examine the rationale for and the nature of governments involvement in allocating water. The use of other theories, such as Gresham's law, and criteria such as accountability, could have strengthened the analysis of government's role in allocating water. Finally I have argued that the assumption underpinning my research method, that individuals are rational self-maximisers, was unnecessary.

Although the 604 project has several important shortcomings, given the chance to rewrite it, I would not change the basic thrust of my argument. I still believe considerable benefits would be provided by allowing trade in consumptive water rights. However, the nature of Central/Local Government's role in allocating instream flows, the question of Maori ownership and accountability issues need more thorough analysis than is presented in my 604 project.

#### References

Otway, H. J. (1982). "Beyond Acceptable Risk: On The Social Acceptability of Technologies," Policy Sciences 14:247-56.

Rowland, C. W. and Marz, R. (1982). "Gresham's Law: The Regulatory Analogy," Policy Studies Review 3:572-80.

Rangitikei-Wanganui Catchment Board and Regional Water Board, (1988). "Wanganui River Minimum Flow Review: Report and Recommendations of The Tribunal".